

**UTILISING RADIO-FREQUENCY IDENTIFICATION TECHNOLOGIES AS
KNOWLEDGE MANAGEMENT ENABLERS IN ACADEMIC LIBRARIES: A CASE
STUDY OF THE UNIVERSITY OF SOUTH AFRICA**

BY

NTOMBIZANDILE CYNTHIA MOGIBA

(Student No: 58538127)

Submitted in accordance with the requirements for the degree of

MASTER OF INFORMATION SCIENCE

at the

UNIVERSITY OF SOUTH AFRICA, PRETORIA

PROMOTER: Dr. JOEL CHIGADA

ABSTRACT

The quest to generate, preserve and utilise knowledge is driving firms and organisations towards a knowledge-based approach to managing organisational knowledge assets. Therefore, knowledge management (KM) is becoming increasingly important for organisations such as academic libraries to enhance their competitive edge in performance, to become more effective and to keep the organisation's knowledge for future use. The importance of KM cannot be overemphasised in terms of how academic libraries can find meaningful and effective ways to manage knowledge resources to improve the services rendered to information users. Pressure is mounting for academic libraries to attain, retain and share knowledge for strategic planning, decision-making and remaining competitive. The adoption of radio-frequency identification (RFID) technologies is one of the preferred approaches to managing organisational knowledge assets; therefore, this was the motivation for undertaking this study in order to understand how these new technologies can change the knowledge management landscape in academic libraries.

A qualitative research methodology, informed by the interpretivist research philosophy, was adopted in this study. Data were collected from a sample of 12 participants using non-probability purposive and convenience sampling techniques. The use of purposive and convenience techniques was ideal for this study because the participants were readily available and possessed the relevant data required to address the research questions and research problem of the study. Open-ended questions were designed to form an interview guide, which was the main data collection instrument. Annual reports, system manuals and user manuals were consulted to augment the primary data collected to address the problem at hand. The findings from the study showed that RFID technologies improved efficiency, tracking and tracing, inventory management and assisted with planning. It was revealed that users of RFID technologies required further training and development to fully utilise these systems for the benefit of the organisation.

The study was conducted using a small sample of 12 participants; therefore, it was recommended that further studies could be conducted with large sample sizes using different research strategies. It was suggested that further research should be conducted to establish how change programmes have been managed before in other departments or sections and how the staff exodus was managed. An organisation-wide research would be recommended to ascertain the views and opinions of a larger population so that findings can be generalisable.

ACKNOWLEDGEMENTS

Education is the most powerful weapon, which you can use to change the world.

(Nelson Mandela, 2003)

I owe a debt of gratitude to relatives, friends, colleagues and well-wishers who helped me and contributed to this study.

Firstly, I extend my sincere appreciation to my promoter, Dr Joel Chigada, at the School of Management Studies at the University of Cape Town, and to my colleagues at the University of South Africa (UNISA), who made significant contributions to this study. Like so many postgraduate researchers, there came a time when I felt discouraged with my studies and wondered if I could continue. Dr. Joel Chigada's counselling was an immense help to me and proved invaluable to this research project and its completion.

I would also like to thank San, Hil, Thanyi, Lungi, MayZu, Nozz-Nozz, Sister Boss (Lettie), and all my colleagues for their encouragement to pursue this study.

Without my confidant, friend, hubby and prayer partner, this study would not have been completed. Thank you Ali, for your support and words of encouragement. My lovely angels and daughters N22ko and Noni, your understanding and support during this journey will forever be appreciated.

In addition, I would like to thank the research participants for agreeing to contribute their viewpoints to this study; without their time and cooperation, this project would not have been accomplished. My sincere thanks and appreciation go to the library management at the University of South Africa (Unisa) for allowing me to conduct this study. To Nozz-Nozz and Lungi (Mkhu), I thank you for all the assistance with my literature searches and for your words of encouragement and support.

The above individuals and institutions deserve special gratitude for their professionalism and assistance, without which this research study would not have been a success.

To each of the above, I extend my deepest appreciation.

DEDICATION

I relied on the support and love of my husband, Ali, my friend and pillar of strength, and my loving daughters, Ntuthu and Nhlanhla, my niece Bisa, my Mom and my sisters, relatives and friends. You offered me encouragement and inspiration throughout the course of this thesis.

In loving memory of my late father, Mzamo, and my friend, mentor and big sister Yoli (Yols). Their pride and contentment at this achievement would have been indescribable.

I dedicate this thesis to all these loving people.

DECLARATION

I, Ntombizandile Cynthia Mogiba declare that the research study on **“Utilising Radio-Frequency Identification Technologies (RFID) as Knowledge Management Enablers in Academic Libraries: A Case Study of the University of South Africa”** is my original work and that all the sources used or quoted have been indicated and acknowledged as complete references, and that the work has not been submitted before for degree purposes.

Name: Ntombizandile Cynthia Mogiba

Signed: 

Date: July 27, 2018

TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGEMENTS	ii
DEDICATION	iii
DECLARATION	iv
LIST OF ACRONYMS	xi
LIST OF FIGURES.....	xii
LIST OF TABLES.....	xiii
CHAPTER ONE: Introduction and background.....	14
1.1 Introduction.....	14
1.2 Definition of terms	16
1.3 Contextual setting	18
<i>1.3.1 Background of knowledge management.....</i>	<i>18</i>
<i>1.3.2 The essence of KM practices in academic libraries.....</i>	<i>19</i>
<i>1.3.3 Background of the Unisa library.....</i>	<i>20</i>
1.4 Justification for the study.....	21
1.5 Research problem	22
1.6 Purpose of the study	23
1.7 Research objectives.....	23
1.8 Research questions	24
1.9 Research design and methodology	24
<i>1.9.1 Research methodology.....</i>	<i>24</i>
<i>1.9.2 Research design.....</i>	<i>24</i>
<i>1.9.3 Sample frame</i>	<i>24</i>
<i>1.9.4 Data collection instruments.....</i>	<i>25</i>
<i>1.9.5 Data analysis and presentation</i>	<i>25</i>
<i>1.9.6 Ethical considerations</i>	<i>25</i>
1.10 Scope and limitations of study	26

1.10.1	<i>Scope</i>	26
1.10.2	<i>Limitations</i>	26
1.11	Organisation of thesis	27
1.12	Referencing style used in the thesis	28
1.13	Chapter summary	28
CHAPTER TWO: LITERATURE REVIEW	29
2.1	Introduction	29
2.2	The role of the literature review	29
2.3	Radio-frequency identification	30
2.4	RFID system components	31
2.4.1	<i>RFID transponder/TAG</i>	32
2.5	Major advantages of using RFID as an auto-ID	33
2.6	The Sun JAVA RFID System	34
2.7	RFID applications	35
2.7.1	<i>Supply chain management</i>	35
2.7.2	<i>RFID in healthcare institutions</i>	36
2.7.3	<i>RFID in libraries</i>	37
2.8	RFID as an enabler of knowledge management	38
2.8.1	<i>Types of knowledge</i>	38
2.8.1.1	<i>Explicit knowledge</i>	39
2.8.1.2	<i>Tacit knowledge</i>	40
2.9	Data, information and knowledge	41
2.9.1	<i>Data</i>	41
2.9.2	<i>Information</i>	41
2.9.3	<i>Knowledge</i>	41
2.10	Knowledge management practices	42

2.10.1 Knowledge creation and acquisition	43
2.10.2 Knowledge sharing	43
2.10.3 Knowledge retention	44
2.10.4 Knowledge dissemination	44
2.11 Benefits of knowledge management	45
2.12 Other knowledge management enablers	45
2.12.1 Organisational culture.....	45
2.12.2 Organisational structure.....	46
2.12.3 Human capital.....	46
2.12.4 Leadership	47
2.12.5 KM systems	47
2.13 Empirical studies on the application of RFID.....	48
2.14 Chapter summary	50
CHAPTER THREE: RESEARCH METHODOLOGY	51
3.1 Introduction.....	51
3.2 Research paradigm	52
3.2.1 Positivist paradigm (Quantitative)	53
3.2.2 Phenomenological research (Interpretive).....	54
3.3 Research design.....	54
3.4 Research methodology.....	556
3.4.1 Quantitative	56
3.4.2 Phenomenological research (Qualitative).....	56
3.4.3 Justification for using qualitative research methodology	57
3.4.4 Research strategy	58
3.5 Target population	59
3.6 Sampling	60
3.6.1 Sampling strategies	60
3.6.1.1 Probability sampling.....	61

3.6.1.2	<i>Non-probability sampling</i>	61
3.7	Data collection instrument	63
3.7.1	<i>Interviews</i>	64
3.7.1.1	<i>Semi-structured interviews</i>	65
3.7.1.2	<i>Advantages and Disadvantages of semi-structured interviews</i>	66
3.8	Pilot study	67
3.9	Data quality	68
3.9.1	<i>Credibility</i>	68
3.9.2	<i>Transferability</i>	68
3.9.3	<i>Dependability</i>	69
3.9.4	<i>Confirmability</i>	69
3.10	Data analysis	69
3.11	Limitations of the study	71
3.12	Elimination of bias	72
3.13	Ethical considerations	72
3.13.1	<i>Ensuring informed consent of participants</i>	72
3.13.2	<i>Ensuring no harm to participants</i>	73
3.13.3	<i>Personal information</i>	73
3.13.4	<i>Ensuring that permission is obtained</i>	73
3.14	Chapter summary	73
CHAPTER FOUR: RESULTS, DISCUSSION AND INTERPRETATION OF FINDINGS		75
4.1	Introduction	75
4.2	Results	76
4.3	Data analysis, interpretation and discussion	78

4.3.1	<i>Understanding of the concept knowledge management</i>	78
4.3.2	<i>Key issues about knowledge management.....</i>	79
4.3.3	<i>Level of involvement in knowledge management</i>	81
4.3.4	<i>Knowledge management practices in the workplace</i>	82
4.3.5	<i>Knowledge management challenges at the academic library</i>	83
4.3.6	<i>Impact of digitisation towards record keeping.....</i>	85
4.3.7	<i>Capabilities of RFID technologies in academic libraries</i>	86
4.3.8	<i>Skills matrix for utilising RFID technologies</i>	88
4.3.9	<i>Challenges of using RFID technologies</i>	89
4.4	Content analysis	90
4.5	Discussion of findings.....	92
4.5.1	<i>Objective 1: To determine the knowledge management practices at the Unisa library.....</i>	93
4.5.2	<i>Objective 2: To determine how RFID technologies enhance knowledge management at the Unisa library</i>	93
4.5.3	<i>Objective 3: To determine factors impeding the utilisation of RFID technologies in knowledge management at the Unisa library</i>	94
4.5.4	<i>Objective 4: To make recommendations on how the utilisation of RFID technologies can improve management in the Unisa library</i>	95
4.6	Chapter summary	95
CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS.....		97
5.1	Introduction.....	97
5.2	Findings from the study	97
5.2.1	<i>Findings from literature review.....</i>	97
5.2.2	<i>Findings from primary study</i>	100
5.2.2.1	<i>Demographics of respondents.....</i>	101
5.2.2.2	<i>Understanding of the concept of knowledge management.....</i>	101
5.2.2.3	<i>Key issues about knowledge management.....</i>	101
5.2.2.4	<i>Level of involvement in knowledge management.....</i>	102

5.2.2.5	<i>Knowledge management in the workplace.....</i>	<i>103</i>
5.2.2.6	<i>Knowledge management in the academic library.....</i>	<i>103</i>
5.2.2.7	<i>Digitisation improve record keeping.....</i>	<i>104</i>
5.2.2.8	<i>Capabilities of RFID technologies in academic libraries.....</i>	<i>104</i>
5.2.2.9	<i>Skills required to utilise RFID technologies.....</i>	<i>105</i>
5.2.2.10	<i>Challenges confronted in using RFID technologies.....</i>	<i>105</i>
5.3	Content analysis	106
5.4	Conclusions.....	106
5.5	Recommendations.....	108
5.5.1	<i>Adoption of RFID systems in line with overall university objective.....</i>	<i>108</i>
5.5.2	<i>Top management should be open and communicate new project concepts, the hide-and-seek approach exacerbates problems.....</i>	<i>109</i>
5.5.3	<i>Adequate training and development.....</i>	<i>109</i>
5.5.4	<i>Towards a knowledge-based approach.....</i>	<i>110</i>
5.5.5	<i>Knowledge management practices.....</i>	<i>110</i>
5.5.6	<i>Top management support and commitment are required for projects to succeed</i>	<i>111</i>
5.6	Areas for further study.....	111
5.7	Conclusion	112
	REFERENCES.....	114
	APPENDIX A: DEMOGRAPHIC INFORMATION	131
	APPENDIX B: RFID and KNOWLEDGE MANAGEMENT	135

LIST OF ACRONYMS

AD	:	Auto identification
AST	:	Adaptive structuration theory
CKO	:	Chief knowledge officers
DVDs	:	Digital versatile discs
EPC	:	Electronic product code
ERP	:	Enterprises resources planning
GSM	:	Global Systems for Mobile Communication
GPS	:	Global Positioning System
GEN2	:	Generation 2 Technologies
ICT	:	Information Communication Technology
ISO	:	International Organization for Standardization
IT	:	Information Technology
JES	:	Java Enterprise System
JIT	:	Just-in-Time
KM	:	Knowledge Management
KMS	:	Knowledge Management Systems
KMOs	:	Knowledge Management Officers
LIS	:	Library and Information Services
MMR	:	Mixed Methods Research
OCR	:	Optical Character Recognition
QDA	:	Qualitative data analysis
RFID	:	Radio-Frequency Identification Technology
RHMS	:	RFID (Based) Health Management Systems
SABINET	:	South African Bibliographic and Information Network
SCM	:	Supply Chain Management
SDK	:	Soft development kit
SECI	:	Socialisation, externalisation, combination and internalisation
SMS	:	Short message service
Unisa	:	University of South Africa
VAS	:	Value-added services
VDF	:	Venture Development Forum

LIST OF FIGURES

Figure 1: Forms of respondents	
Figure 2:.1 RFID system components	
Figure 2:.2 The IBM sensor and actuator solutions framework	
Figure 3:	
Figure 3.1 Sampling strategies.....	
Figure 3.2 Forms of interviews.....	
Figure 3:3 Qualitative data analysis.....	

LIST OF TABLES

Table 3.1: Quantitative and qualitative paradigm assumptions

Table 4.1: Respondents codes

CHAPTER ONE: INTRODUCTION AND BACKGROUND

The greatest enemy of knowledge is not ignorance, it is the illusion of knowledge.

(Hawking, 2011)

1.1 Introduction

In the knowledge-based economy, managers focus more on knowledge capital than on traditional assets, and on the capability of organisations to harness these knowledge assets (Chigada & Ngulube, 2014). One approach is to exploit and embrace state-of-the-art technologies to leverage organisational competitiveness before competitors take the market by surprise. A variety of technologies enable the practice of knowledge management in academic libraries and in this way facilitate communication between management and employees, as well as faster access in the search and retrieval of information. Radio-frequency identification (RFID) technologies are gaining recognition in many institutions that need to monitor and control the movement of information resources, such as books, eBook readers, CDs (compact discs) and DVDs (digital video discs or digital versatile discs), to name only a few. RFID is only one of numerous technologies grouped under the term automatic identification (auto ID), such as bar codes, magnetic inks, optical character recognition, voice recognition, touch memory, smart cards, biometrics, and so on. Auto ID technologies are a new way to control information and material flow, and is especially suitable for large production networks (Ilie-Zudor, Kemeny, Egri & Monostroi, 2006:29).

This study explores how RFID-enabled technologies help to provide accurate, relevant and timeous information to library and information services (LIS) managers in making informed decisions at the academic library of the University of South Africa (the Unisa Library). The focus of the study is to determine how RFID-enabled technologies will create an enabling environment and manage knowledge practices in academic libraries. In line with the nature of how libraries operate, there is a dire need to improve the monitoring, securing, tracking and tracing of library information resources to support meaningful decision-making. In the knowledge economy, it has become important for managers to see the benefits of focusing on knowledge assets over traditional assets in order to enhance and sustain organisational competitive advantage.

However, there is a dearth of information to suggest that the Unisa library fully utilises RFID technologies to enhance its knowledge management practices such as acquisition, creation,

sharing and retention. The sustainability of a competitive academic library flows from the creation, ownership, protection and storage of difficult-to-imitate knowledge assets. The only way to achieve competitive advantage is by embracing knowledge management and there are various enablers that enhance the adoption of knowledge management, namely information communication technologies (ICTs), organisational culture, leadership and strategy. This study seeks to ascertain how RFID technologies can and do enhance knowledge management at the Unisa library.

Ching and Tai (2009) confirm that technology has evolved at an incredible rate in the last decade. They point out that technology can help change the way librarians serve their clients and perform their work in an attempt to create, acquire and share information and knowledge resources. The appropriate deployment of technology is likely to improve knowledge management practices in academic libraries as well as service quality and efficient operations. One approach that is gaining popularity is the adoption of RFID, which has had significant economic impacts in many industries, especially in academic libraries, where the uptake of technology has been at a slower pace (Uniform Code Council, 2006). While RFID is a relatively old technology, more recent advancements in chip manufacturing technology are making RFID practical for new applications and settings, particularly consumer item level tagging. These advancements have the potential to revolutionise supply-chain management, inventory control and logistics, thus providing up-to-date, accurate information and knowledge for decision-making. Organisations that harness knowledge assets and information resources tend to have a competitive advantage (Ching & Tai, 2009).

The slow uptake of technologies in academic libraries impedes access to real-time information and knowledge that is paramount in academia or research, thus, users of information may feel short-changed by a lack of access to fundamental knowledge (Want, 2004). The underutilisation of RFID technologies impedes the provision of relevant, accurate and timeous information to assist LIS managers to establish knowledge management practices and processes that create an enabling knowledge management environment.

LIS managers should have systems in place that help users acquire, share, create and retain knowledge assets. With the introduction of RFID technology, LIS managers will be able to identify, monitor and control the movement of information resources from one place to another and communicate that information to library users regarding when the resources will be

available (Want, 2004:85). In order to improve knowledge management practices such as sharing, storage, retrieval and acquisition, the introduction and use of RFID technologies will play an important role in knowledge management in academic libraries.

1.2 Definition of terms

The key concepts and terms that underpin this study are the following:

Defining the academic libraries: San José State University (2018) defines academic libraries as an important part of higher education institutions that usually serve two complementary purposes: to support the university's curriculum and to support faculties and student research of the university. Academic libraries are vibrant information and knowledge hubs that support students, researchers, lecturers and administrators. Academic libraries can also be defined as repositories of institutional memory and worldwide information provided in a variety of sources. They are centres of intellectual interaction.

Academic libraries serve colleges and universities, their students, staff and faculty. Because larger institutions may have several libraries on their campuses dedicated to serving particular schools, such as law and science libraries, academic librarianship offers a great opportunity to utilise subject expertise (American Library Association, 2018).

Defining explicit knowledge: According to Tiwana (2008:45), explicit knowledge is that component of knowledge that can be codified and transmitted in a systematic and formal language: documents, databases, webs, electronic mails and charts.

Defining knowledge: The nature of knowledge has been described as a 'justified true belief' (Nonaka & Takeuchi, 1995). According to Davenport and Prusak (1998), knowledge is a fluid of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. On the other hand, Bollinger and Smith (2001) describe knowledge as the understanding, awareness or familiarity acquired through study, investigation, observation or experience over the course of time. Knowledge is the most valuable resource because it embodies intangible assets, routines and creative processes that are difficult to imitate (Hyypia & Parjanen, 2008:225).

Defining knowledge management (KM): Nonaka (1991) and Tiwana (2008) define KM as an established management approach that has been successfully applied across corporate sectors by methodically creating, sharing, preserving and optimally applying the extensive knowledge present in the organisation to better achieve organisational objectives.

Defining tacit knowledge: Mostert and Snyman (2007) define tacit knowledge as an idiosyncratic, subjective, highly individualised store of knowledge and practical expertise gathered through years of experience and direct interaction within a domain, while Tiwana (2008) states that tacit knowledge is gained from experience rather than instilled by formal education and training.

Defining Radio Frequency Identification: RFID is one of the means of identifying a person or object using waves to communicate among a system of integrated circuits, tags, readers and software. RFID refers to the technology in which the RFID tag transmits a radio frequency signal that is picked up by a reader (Singh & Mahajan, 2014). The history of RFID technology dates back to World War II where this technology was used to differentiate between friendly and enemy aircrafts. Since then, RFID technology has evolved and has been applied to animal tracking and identification, speed pass lanes on toll roads, building security access and for electronic payment processes at petrol and gas stations, and many other industries where tracking and tracing are paramount. The basic components of any RFID system include tags and readers (Sikander, 2004) which are bar-coded and can be read by electronic RFID readers.

Butters (2008:198) opines that RFID represents a range of rapidly evolving technologies that are being adopted by businesses and other organisations worldwide, particularly in the Asia Pacific region. RFID technologies are also used to identify and track people, animals and things such as varied medical equipment, casino poker chips and oak wine barrels (Yahia, 2010:107). O'Connor (2007) states that RFID technologies offer identification beyond the line of sight and the possibility of identifying dozens, if not hundreds, of individual items at a high speed. The global advancement of technology is compelling proponents of RFID to increasingly converge with other technologies such as sensors, Global Positioning Systems (GPS) and global systems for mobile communications (GSM) to provide accurate real-time location and environmental information (Venture Development Forum (VDF), 2005). There are various applications that utilise RFID technologies and these are briefly discussed below. The discussions will highlight

the growing use of RFID technologies, thus further supporting the reasons for undertaking this study.

1.3 Contextual setting

The contextual setting of this study is the University of South Africa library, based in Muckleneuk, Pretoria. The key issues that will be presented in this section include the background of knowledge management, the importance of knowledge management practices in academic libraries and the background of the Unisa library.

1.3.1 Background of knowledge management

Wiig (1999) and Grant and Grant (2008) state that the study of KM dates back more than two millennia when philosophers and scientists tried to understand the nature of knowledge and most of the studies extensively discussed models and frameworks for KM that are in use in the corporate world today. “Of special note in the evolution of KM is the work of Michael Polanyi” (Grant & Grant, 2008). It was pointed out earlier that Polanyi’s (1962) theory of ‘Personal Knowledge’ became the foundation of all KM theories. Polanyi’s (1962) theory was based on the belief that all knowledge is to some degree tacit and he spoke of “knowing” rather than of “knowledge” (Grant & Grant, 2008).

The area of KM has grown rapidly over the last two decades, compelling organisations to realise that knowledge and information are key strategic tools needed to make informed decisions. Many organisations began to recognise the importance of KM when it rose to prominence in the early 1990s (Grant & Grant, 2008). During that period, scientists and philosophers did extensive KM research and developed theories and models with the specific aim of extracting a deeper understanding of KM. Nonaka (1991) corporatized Polanyi’s concept of personal tacit knowledge by developing the socialisation, externalisation, combination and internalisation model (SECI Model). The SECI Model’s fundamental assumption is that tacit knowledge can be transferred and converted to explicit knowledge, and it became the cornerstone of Nonaka’s (1991) work and was the widely adopted KM concept in its first generation (Grant & Grant, 2008).

In addition to his SECI Model (Nonaka, 1991), Nonaka (1995) also suggest the need to create an appropriate environment in which knowledge can be created and transferred. This is referred to as ‘*ba*’, meaning a shared space for emerging relationships, which might be physical, virtual

or mental, providing a platform for advancing individual and / or collective knowledge. The background of KM sets the tone from which this study explores the utilisation of RFID technologies as enablers of KM in academic libraries.

1.3.2 The essence of KM practices in academic libraries

Chigada (2014) states that knowledge and information are key strategic tools needed to make informed decisions. In highly competitive environments, the rise of the knowledge economy is leading to a shift in emphasis from products to knowledge and also to the role of value-added services (VAS), knowledge creation and knowledge utilisation activities. According to Cong and Pandya (2003), KM provides increased performance through more efficient, productive, innovative and quality processes. Enhanced performance is reflected in more informed decision-making, streamlined processes, reduced duplication, more innovation, advanced data integrity and greater cooperation within the organisation; thus, KM contributes to cost efficiency and improved service delivery. Of the few KM studies (Mostert & Snyman, 2009; Kok, 2003) done in the South African higher education sector, limited research has been done to determine the impact of KM and how RFID enables KM in academic libraries.

Through the implementation of KM practices and technologies, academic libraries are poised to deliver the best possible services, function effectively and operate in environments characterised by transparency and accountability. In support of Gaffoor and Cloete (2010), Fowler and Pryke (2003) point out that “one of the implications is that organisations should be strategically aligned with their clients and stakeholders to provide better services and understanding their clients’ needs”. Public institutions and private organisations should constantly communicate with their customers to determine and ensure that their needs and wants are fully addressed, culminating in the development and provision of solutions. This gives both parties an opportunity to share knowledge, which is then translated into information stored in documents, thus eventually becoming organisational knowledge. For LIS managers to be able to preserve organisational knowledge, knowledge creation, sharing and retention strategies, supported by KM enablers, should be available in an organisation.

Scholars such as Nonaka and Takeuchi (1995), Kok (2003), Wiig (2004) and Tiwana (2008), concur that the creation and management of knowledge requires an appropriate environment. Tiwana (2008) states that an appropriate environment means an environment where top

management pays attention to people, culture, working conditions, motivation, organisational structure and information technology (IT). Top management is required to create an environment that encourages and supports knowledge sharing and knocks down the cultural barriers that exist in organisations today. Wiig (2004) is of the view that some organisations are appointing knowledge management officers (KMOs) specifically responsible for formulating a knowledge vision and policy (and not to govern the effective use of knowledge). In addition to this, the implementation of KM is often impeded by top management's resistance to change, especially with regard to people, processes and technology (Kok, 2003).

1.3.3 Background of the Unisa library

The Unisa Library came into being in 1946 when the University of South Africa introduced distance learning as a mode of tuition and the first Unisa library book was accessioned. In 1972, the Unisa library opened its doors on the Muckleneuk campus. The library's collection kept on growing and the one-millionth library book was accessioned in 1984 in line with the establishment of a library for a fellow distance education institution, Technikon SA (which would later be merged with Unisa). In 1988, the Unisa library started operating from the Samuel Pauw Building from where it still operates today. The Technikon SA library also moved to a new building in 1993. Three years later, in 1996, the Unisa library celebrated 50 years of service to teaching and research, and Technikon SA established Infobridge in 1998 and received the Dr Allan Boesak Papers. Over the years, Unisa has established many branches and each branch has a library, resulting in the use of the term 'Unisa libraries' in this study. Infobridge are content management systems that provide organised collection of documents, which can be managed through well-defined processes (Ngulube, 2017).

In 2000, the Unisa library hosted the official conference of the Eastern, Central and Southern African Library and Information Association (SCECSAL). In 2003, Unisa celebrated 130 years as a university of distance education. The Unisa library became custodian of the Denis Goldberg Collection.

In 2004, the Minister of Education introduced the merger of Technikon SA (based in Florida, Roodepoort) with the University of South Africa, and this meant the merger of the two libraries as well. The last 50 years has been a period of rapid growth, with the printed book collection now reaching its two millionth book accession in 2009. With the paradigm shift in information provision, the Unisa library started embracing the purchase of e-collections such as e-books

and e-journals, both packages and single titles, and further developed its collection with e-resources and online databases. This strategy was informed by the huge information resources budget that the Unisa management allocated to the Unisa library. The Unisa institutional repository was one of the milestones of the Unisa library in support of sharing knowledge to advance research and to record and make available research completed at Unisa and other research and conference papers.

To enhance access to, and the sharing and preservation of, knowledge, especially archival and rare collections, the Unisa library contracted SABINET to digitise these collections. The Unisa library further improved its services by purchasing RFID in its totality (self-check and return box, sorter machine to sort books to different bins for easy shelving, conversion of item information loaded in barcodes to RFID tags, etc.) for tagging and scanning the collection.

1.4 Justification for the study

Creswell (1998) observes that the justification of a study explains the importance of the study. The importance of carrying out detailed research on the use of RFID technologies as enablers of KM in academic libraries cannot be overstated. Firstly, RFID is a relatively new technology that has been confined to tracking and tracing parcels from one place to another in the logistics and supply chain industries. This study will raise awareness of the importance of utilising RFID technologies to manage and control information resources while producing accurate and timeous reports needed to make informed decisions.

The findings from the study will demonstrate a series of important issues related to RFID as an enabler of KM: the importance of the utilisation of RFID technologies, creating an organisational culture that enables KM and the benefits of a knowledge-based organisation. Having justified the significance of this study to all stakeholders, this study is poised to expand the general knowledge base for further research in the area of RFID in propagating knowledge management in academic libraries.

This is the first study to have been conducted at the Unisa library to establish why RFID technologies are not fully utilised as KM enablers at the university. Both management and staff need accurate information to make informed decisions. The success of academic libraries depends on their ability to utilise information and the knowledge of its staff to better serve the needs of the academic community, administrative staff, students and researchers. Lee (2000:1)

points out that knowledge and experience of library staff are intellectual assets of any library and should be valued and shared. Academic libraries have the responsibility to recognise their valuable knowledge assets in order to avoid putting themselves in situations where they fail to figure out the knowledge needed or the management of knowledge in the context of application (Sharma & Chowdhury, 2007:13).

This study will help academic librarians benefit from integrating knowledge management into library processes by means of technology, because they enable knowledge sharing in their libraries. They can also benefit from having collaborations among involved parties and ensuring they complement the creation of knowledge management programmes in their libraries. The study will also unpack the importance and impact of RFID technologies as used in academic libraries. The findings of the study will become a learning paradigm for LIS professionals in academic libraries that are not using RFID enabled systems.

1.5 Research problem

The Unisa library has been losing vital knowledge assets, is failing to account for all information resources on the inventory and is unable to produce relevant information resources reports needed for decision-making due to the slow uptake of technologies that will assist in the adoption of a knowledge management policy. In addition, the Unisa library lacks proper knowledge recording systems that can assist management in decision-making. In today's knowledge era, organisations are compelled to reassess existing processes and strategies to remain relevant and competitive. Knowledge management (KM) is, to a great extent, cited as a strategic asset and source of competitive advantage that should be granted priority in organisations (Gaffoor & Cloete, 2010). LIS managers are expected to focus more on knowledge capital than on more traditional assets and on the capabilities of their universities to harness knowledge assets. Apparently, the underutilisation of RFID technologies impedes the provision of relevant, accurate and timeous information to assist LIS managers to establish knowledge management practices and processes that create an enabling knowledge management environment. Information communication technologies (ICTs) are perceived as the panacea for improved knowledge management practices (Cong & Pandya, 2003). ICTs, such as RFIDs, are expected to enhance knowledge management in academic libraries (Chao, Yang & Jen, 2007; Bendavid et al., 2009). Therefore, the researcher would like to investigate how RFID technologies will enable knowledge management in academic libraries, specifically focusing on the Unisa library.

Despite the RFID systems being in place, the underutilisation of the systems poses major challenges for the Unisa library. Library staff are unable to generate timeous and accurate reports. The underutilisation of ICTs and RFID technologies has compelled library staff to revert to manual systems that impede the monitoring and controlling, movement, and tracking and tracing of information resources in the institution's various academic libraries. Non-utilisation of RFID technologies exposes the Unisa academic libraries to a loss of knowledge and information resources through pilferage and unaccounted for inventories. In addition, non-utilisation of the features of these technologies has contributed to the inadequate reporting on the usage of information resources, reporting for audit purposes, and, in turn, inadequate information for decision-making and knowledge sharing. The challenges facing the Unisa academic libraries are supported by Ghazali, Lefebvre & Lefebvre, (2012) who state that RFID systems have the potential to improve real-time document and material tracking and control. But, more importantly, findings suggest that RFID improves the management, sharing and transfer of knowledge to foster collaboration through integrated document management, prompt issue management, risk management and efficient decision-making (Ghazali et al., 2012).

1.6 Purpose of the study

The aim of the study is to investigate how RFID technologies can enable knowledge management at the University of South Africa's academic libraries as well as suggest ways how these technologies may be enhanced to improve knowledge management.

1.7 Research objectives

The following research objectives guided the study:

- To determine the knowledge management practices at the Unisa library
- To determine how RFID technologies enhance knowledge management at the Unisa library
- To determine factors impeding the utilisation of RFID technologies in knowledge management at the Unisa library
- To make recommendations on how the utilisation of RFID technologies can improve knowledge management in the Unisa library.

1.8 Research questions

The following research questions were formulated:

- What are the knowledge management practices at the Unisa library?
- How do RFID technologies enhance knowledge management at the Unisa library?
- What factors impede the utilisation of RFID technologies in knowledge management at the Unisa library?
- What recommendations can be made on how to improve the utilisation of RFID technologies as knowledge management enablers in the Unisa library?

1.9 Research design and methodology

A qualitative research methodology was used in this study. Data collected from 12 research participants by means of face-to-face interviews were recorded with the aid of a voice recorder and transcribed.

1.9.1 Research methodology

Research methodology is the mapping out of an approach to solve a research problem. Research methodology is a systematic way to solve a research problem scientifically and it “encompasses research methods as well as the logic behind the chosen methods of the study” (Kothari, 2004:8). Major methods used in studies are qualitative and quantitative methods. A qualitative research approach was used in line with the continuum of the interpretivist paradigm.

1.9.2 Research design

An exploratory research design was used in this study, where the unit of analysis was the Unisa library. Therefore, the case study was adopted to understand how RFID technologies were used as KM enablers at the Unisa library. The case study was used because the researcher was able to answer the “what” and “how” questions, which informed this study. The case study approach placed a great premium on objectivity and reliability of findings and encouraged replication of results (Saunders, Lewis & Thornhill, 2012:185), thus supporting the assumption that the researcher was independent of and not affected by the subject of the study.

1.9.3 Sample frame

A sample frame includes all individuals in a target population (Saunders et al., 2012). The population for the current study was 60. The data for this study resided with managers from

different directorates; it was imperative, therefore, to collect data from the relevant sample. The sample for the study comprised 12 participants selected from library middle management and supervisors, library cataloguing, distribution, information, procurement and library technology sections. Both purposive and convenience sampling techniques were used to collect qualitative data, because the sample members were readily available or accessible, and the researcher had specific research objectives in mind.

1.9.4 Data collection instruments

The type and quality of data collected in any study should be plausible. To ensure the integrity of data, credible data collection instruments (interviews and document analysis) were used during the research process. Besides the extensive literature review made in this study, the interviews were used to extrapolate data substantiating the theory that RFID is an enabler of KM in academic libraries, resulting in triangulation (Rowley, 2002:16). Triangulation involves the process of combining and comparing data from multiple sources, while corroborating the findings.

1.9.5 Data analysis and presentation

All qualitative data were coded and cleaned before being presented (Ngulube, 2005). The study identified relationships between variables to determine emerging themes that support the study. The researcher separated relevant data from irrelevant data in the survey and then broke it down into small segments, which were grouped into categories that reflect the various aspects of the phenomenon as it was experienced. Nvivo 10 qualitative data analysis software was used to analyse data for this study.

1.9.6 Ethical considerations

According to Cohen (2007:1), ethical considerations are an essential aspect of any research. There may be several factors that may confront researchers. Firstly, this study was approved by the Department of Information Science at the University of South Africa (Unisa) and cleared by Unisa's Research Ethics Board before being undertaken. These processes were undertaken to ensure compliance with Unisa's Policy on Research Ethics (2007). The policy specifies that researchers must avoid undertaking secret or classified research. In doing so, the study ensured that the following ethical dimensions were addressed to avoid diluting the research process.

Inducement to participate: Individuals' participation was given freely, specific and based on informed consent. Direct or indirect coercion, as well as undue inducement of people in the name of research, was avoided. The researcher informed prospective participants of the purpose of the study (Unisa, 2007) and the study participants were advised that participation in the study was voluntary.

Personal information: Chigada (2014) states that if personal information is collected and processed, the researcher must ensure that the informed consent of the participants is specifically granted. The researcher ensured that participants' personal information was not discussed with any third parties and responses were locked away in a safe place. During data collection, participants were advised not to write their names on the questionnaires and the responses were kept locked away in the safe.

Honesty: The research was conducted in an honest, fair and transparent manner and the participants were informed of the purpose and benefits of the study (Stangor 2011). Once this study is completed, respondents and other stakeholders of this study will be provided with a link to the study for reference purposes.

1.10 Scope and limitations of study

The scope and limitations of the study are discussed below. The first section discusses the scope, followed by limitations in the second section.

1.10.1 Scope

This study investigated how RFID technologies are used as knowledge management enablers and to what extent the Unisa library has adopted RFID technology. The focus was on the Unisa library. The study did not discuss the Unisa library management nor the value of the information resources' stock, private or confidential information, or issues outside the parameters of this study.

1.10.2 Limitations

The first limitation of the study was that library management was involved in this study, therefore, the exclusion of other members of staff created a gap that resulted in one-sided findings. The use of a purposive sampling technique created opportunities for bias because research participants were purposively selected on the basis of possessing relevant data. The

second limitation was the sensitivity the research carried. Some respondents did not divulge as much data as was needed for the study for fear of reprisals.

1.11 Organisation of thesis

This study comprises five chapters, with each chapter starting off with an introduction and concluding with a summary.

Chapter 1: Introduction and theoretical background

Chapter One provides an introduction to KM and the theoretical background and context of the research. The chapter also discusses the research problem, problem statement, purpose, significance, objectives, questions, scope, limitations and layout of the thesis. The facets underpinning the originality of this study are also discussed in this chapter.

Chapter 2: Literature review

Chapter Two highlights the historical developments and evaluation of existing KM enablers, knowledge work, benefits, practices and other empirical studies done. The literature includes company records, reports, academic papers, journals, internet and other sources related to the study. The main areas covered in this chapter are types of knowledge, knowledge management systems, enablers and empirical studies on knowledge management and organisational performance. Multiple cases are discussed to determine if they support the theory that KM plays a significant role in enhancing organisational performance.

Chapter 3: Research design and methodology

This chapter focuses on the research design and methodology strategy employed for this study. Areas covered in this chapter are population, sample frame, size, selection criteria, data quality and data collection methods. In addition, the measurement instruments used (their development, standardisation, item formats, reliability, validity and norms) are discussed. The role of the researcher is explicitly defined, together with the steps that are taken to strengthen the trustworthiness of interpretations and conclusions. Each aspect of investigation is justified and explained in full. The study also discusses ethical considerations during data collection.

Chapter 4: Findings and presentation of study findings

Chapter Four presents and interprets the findings of the research. These results are presented in a logical sequence, in the order in which the specific purposes of the study have been

formulated. The study presents and analyses results directly relating to the methods of analysis, justification for their choice, the results of the investigation and the significance of the results. The overall research and the research analysis are discussed in this chapter. A critical evaluation of these results is done in an attempt to ascertain their contribution to knowledge in the field of knowledge management. The findings are compared with results of previous studies insofar as this may contribute to a better understanding of the research problem.

Chapter 5: Summary, conclusions and recommendations

The last chapter wraps the thesis up with a summary of the objectives and findings of the study. Gaps identified in the study are summarised, and conclusions and recommendations to bridge the gaps are made in this chapter. The last part of the chapter points out what further investigations appear to be necessary for a better understanding of KM and RFID technologies as enablers of KM.

1.12 Referencing style used in the thesis

Mavodza and Ngulube (2011:26) posit that conducting research and acknowledgement of scholarly works and ideas by other people are achieved by referencing and citing. The Unisa College of Postgraduate Studies recommends the Harvard citation style. The significance of the Harvard citation style is the fact that ‘in a Master’s thesis, appropriate citation and critique signals the espousal of the appropriate values, etiquette, style and cultural savvy’ (Mavodza & Ngulube, 2011:27).

1.13 Chapter summary

Chapter one provided an introduction to, and discussion of, the theoretical background to the study of knowledge management and RFID technologies, while highlighting the significance, objectives and purpose of the study. Detailed discussions were provided in this introductory chapter to justify the relevance of the study and its significance to academic libraries and researchers. In the discussion presented, every effort was made to ensure clarity in all sections of this chapter. Before the chapter was summarised, the structure of the research report was presented. The next chapter describes how past and recent literature converges on the view that KM is a key organisational asset that should be preserved as a competitive edge.

CHAPTER TWO: LITERATURE REVIEW

Of central importance is the changing nature of competitive advantage – not based on market position, size and power as in times past, but on the incorporation of knowledge into all of an organisation's activities (Leif Edvinsson, 2002)

2.1 Introduction

In the previous chapter, the focus was on presenting the background to, and the significance of, undertaking this study. In this chapter, the focus is on discussing the theoretical underpinning of knowledge management, its effects on, and importance to, academic libraries. This chapter is designed to help one appreciate the theoretical background of RFID technologies and how these knowledge management (KM) enablers are transforming the KM landscape in South Africa, specifically in academic libraries. Davenport and Prusak (1998), Wiig (1997) and Nonaka and Takeuchi (1995) are credited with advancing the concept of knowledge management in many firms. Theories on KM drawn from some of these authors provide the theoretical support and base for the study. These theories explain the relationship between knowledge management practices and organisational performance. The first part of this chapter presents a discussion of the foundations of knowledge management and of KM practices and RFID.

2.2 The role of the literature review

Chigada (2014), in Mavodza and Ngulube (2011), states that it is important for the researcher to do some reading of other researchers' work to gain an insight, understanding and knowledge of the subject under investigation. Reviewing the literature helps the researcher to summarise and synthesise ideas already put forward by others. Leedy and Ormrod (2010) also point out that reviewing literature allows the researcher to look again at what others have said in areas that are similar, although not identical, to the current research. Studies by Ngulube and Lwoga (2007), Wamundila and Ngulube (2011), Chigada (2014) and Nonaka (1991; 1995) will be consulted to provide the nucleus of the study. Chigada (2014) opines that KM is a progressing paradigm that contributes significantly to the creation, sharing and storage of knowledge and the generation of information for the contemporary business environment. The literature review is a summary of important information and a pertinent reshuffling of that information. In the present study, the literature review acted as a handy guide for the research process.

2.3 Radio-frequency identification

RFID is a way of identifying a person or object using waves to communicate within a system of integrated circuits, tags, readers and software to identify items. RFID refers to the technology in which the RFID tag transmits a radio frequency signal that is picked up by a reader (Singh & Mahajan, 2014).

RFID is a form of the Automatic Identification and Data Capture (AIDC) technique (Ishikawa et al., 2003) Polniak (2007) confirms that RFID was recently used in a wide range of areas such as supply chain management (SCM), health care, traffic monitoring, retail and access control. The ability to store large amounts of data and identify items which are not in the line of sight has given RFID technology an edge over other automatic identification approaches such as the barcode-based systems (Ishikawa et al., 2003) and optical character recognition systems (OCR) (Phoenix Software International, 2006). For example, the integration of RFID technology into SCM systems has resulted in reduced losses and improved visibility in various stages of the supply chain (Sheng et al., 2008) In addition, SCM systems incorporating RFID systems have experienced reduced numbers of data entry errors, efficient inventory management and lower human labour costs in distribution centres (Tutorial-Reports, 2007).

Ishikawa et al. (2003) describe the architecture of RFID as a binary code, comprising a field of bars and gaps arranged in parallel configuration, which is used by the barcode-based identification systems. The analysis of the reflected beam on the bar gaps allows the numerical and alphanumerical interpretation of the barcode sequence made up of narrow and wide bars. The interpreted value obtained specifies a unique code that is used for object identification (Butters, 2008). The disadvantage of the barcode system is that the barcode needs to be aligned in order to be read by the laser scanner (Ishikawa et al., 2003). The OCR-based systems consist of optical machine readers used to recognise alphanumeric codes, which are placed on the objects to be uniquely identified. The drawbacks of this system consist of the cost of the operation and the complexity of the OCR readers (Phoenix Software International, 2006).

There are various applications that are utilising RFID technologies and these are discussed later in this chapter. The discussions will highlight the growing use of RFID technologies, thus further supporting the reasons for undertaking this study. An illustration of RFID architecture is depicted in Figure 2.1, followed by a discussion of the RFID components.

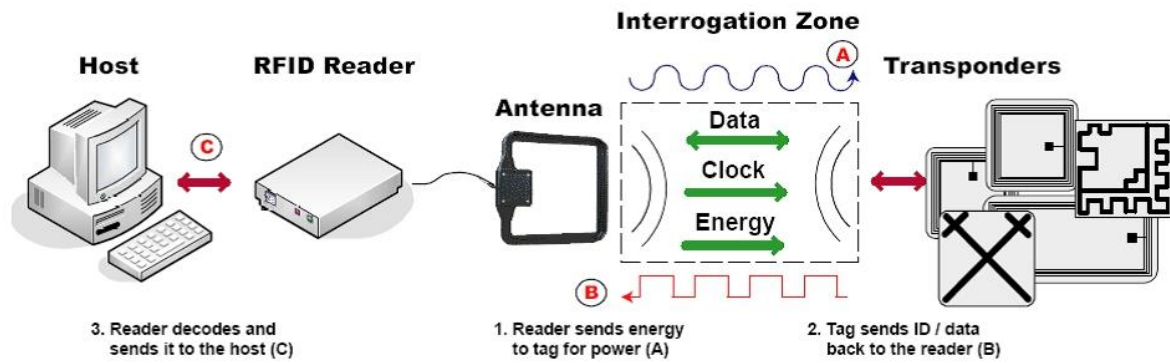


Figure 2.1 RFID System Components

Source (Glasser et al., 2007)

2.4 RFID system components

The RFID systems basically consist of three elements:

- A tag/transponder
- A reader
- A middleware deployed at a host computer

The *RFID tag or transponder* is the data carrier part of the RFID system, which is placed on the objects to be uniquely identified. The *RFID reader* is a device that transmits and receives data through radio waves using the connected antennas. Its functions include powering the tag and reading/writing data to the tag. As shown Figure 2.1 above, the signals sent by the reader's antennas form an interrogation zone made up of an electromagnetic field. "When a tag enters this zone, it gets activated to exchange data with the reader" (Al-Mousawi, 2004). Later, the identification data read by the RFID reader is processed by the software system, known as the RFID middleware. The *RFID middleware* manages readers, and filters and formats the raw RFID tag data so that they can be accessed by the various interested enterprise applications (Floerkemeier & Lampe, 2005). Hence, the middleware is a key component for managing the flow of information between tag readers and enterprise applications (Burnell, 2008). The countless variants of RFID systems indicate that many manufacturers are producing these technologies.

2.4.1. RFID transponder/TAG

The RFID transponder, or tag, consists of a chip and an antenna. A chip can store a unique serial number or other information based on the tag's type of memory. This memory can be read-only, read-write, or write-once and read-many (United States Government Accountability Office, 2005). Read-only tags are much cheaper to produce and are used in most current applications. Read-write tags are useful when information needs to be updated (Al-Mousawi, 2004). The antenna is used to transmit information from the chip to the reader and the larger the antenna, the longer the read range. The RFID tag can be either attached to or embedded in an object to be identified, and can be scanned by mobile or stationary readers using radio waves (United States Government Accountability Office, 2005). The different RFID tags are: passive tags, active tags and semi-passive / semi-active tags.

(a) Passive Tags

At present, the simplest version of RFID tags does not contain their own power source, such as a battery, and cannot initiate communication with the reader. The passive tag derives its power from the energy waves transmitted by the reader and responds to the reader's radio frequency emissions, therefore the passive tag relies entirely on the reader as its power source. A passive tag should store, at a minimum, a unique identifier for the item tagged and can be read from a range of about 10 to 20 feet under perfect conditions (United States Government Accountability Office, 2005). Passive tags have lower production costs, meaning that they can be applied to less expensive disposable goods (for example, a bottle of shampoo). The major determinants of passive tags are the radio frequency used, the amount of memory, the design of the antenna and other tag requirements. Passive tags can operate at low, high, ultrahigh or microwave frequency. The development of passive RFID tags has led to their wide-scale use in many organisations. Examples of passive tag applications include mass transit passes, building access badges and consumer products in the supply chain (United States Government Accountability Office, 2005).

(b) Active tags

Active tags are the complete opposite of passive tags, because active tags contain a power source and a transmitter, in addition to the antenna and chip, and send a continuous signal. Typically, these tags have read / write capabilities; tag data can be rewritten and/or modified. Active tags can initiate communication and communicate over longer distances of up to 750

feet, depending on the battery power. Active tags are more powerful than passive tags because these tags contain more hardware than passive RFID tags. They are more expensive to produce and are reserved for costly items that need to be readable over greater distances (United States Government Accountability Office, 2005). Usually, RFID manufacturers do not quote prices for active tags without first determining their storage type, quantity and range.

(c) Semi-passive tags

Semi-passive tags do not initiate communication with the reader, but contain batteries that allow the tag to perform other functions, such as monitor environmental conditions and power the tag's internal electronics. In order to conserve battery life, some semi-passive tags do not actively transmit a signal to the reader. Instead, they remain dormant until they receive a signal from the reader. Semi-passive tags can be connected to sensors to store information for container security devices (United States Government Accountability Office, 2005). Semi-passive tags have a middle cost and transmission range (Vacca, 2009). In summary, passive tags are consequently much lighter and less expensive than active tags and offer a virtually unlimited operational lifetime. The trade-off is that they have shorter read ranges than active tags and require a higher-powered reader (Association for Automatic Identification and Mobility, n.d.).

2.5 Major advantages of using RFID as an auto-ID

The following are some of the important advantages in the use of RFID technology:

- RFID readers do not require a line of sight to access data from the RFID tags.
- RFID systems can read data over varied distances, from a few centimetres to hundreds of meters.
- RFID readers can interrogate and speed up the tag-reading process.
- RFID systems can read and write different sizes of data from or to the tag, based on the type of tag.
- RFID systems can read tags in harsh environments, without any human intervention.

As RFID systems have progressively and significantly improved, RFID technology is becoming ubiquitous. A variety of makes and models of RFID tags and readers, combined with decreasing RFID hardware prices, are making RFID deployment more attractive (Glasser et

al., 2007). In the traditional applications of RFID, such as access control, networking was not a concern and there was barely a need for an RFID middleware solution. However, in the novel application areas such as SCM, a number of RFID readers could be used to capture RFID data, which need to be disseminated to a variety of enterprise applications. Hence, there is no longer a one-on-one relationship between reader and application (Floerkemeier et al., 2007).

The researchers in this area have reported a vast amount of research (Burnell, 2008) about the benefits, possible misuses, ethical issues (e.g. privacy), and technical issues (Floerkemeier & Lampe, 2004) involved in RFID technology. However, less significant attention has been paid to the issues involved in the RFID middleware that manages large deployments of readers producing high volumes of captured data and encapsulates applications from low-level data by transforming them into more meaningful events (Burnell, 2008). In addition, not much research has been done to ascertain the extent of the use of RFID in academic institutions, specifically in academic libraries. Considering this void in the research, it is imperative to discuss RFID in the context of knowledge management enablers.

2.6 The Sun JAVA RFID System

Sun Java System RFID software is a Java-based commercial middleware platform provided by Sun as illustrated in Figure 2.2 below. It is a critical RFID infrastructure component that allows safe, secure and efficient data and device integration from the edge of the enterprise into enterprise application systems. It has a dynamic, service provisioning architecture that enables scaling from small pilots to large deployments with high data volume (Sun Microsystems, 2006 b).

The Java System RFID software supports a variety of new and existing standards, such as Electronic Production Code (EPC), the International Organization for Standardization (ISO), Generation 2 (Gen 2) passive and active tags and devices, read/write tags, and commercial and government standards. It is a part of the Java Enterprise System (JES) and has four components as shown in Figure 2.2: the RFID Event Manager, the RFID Management Console, the RFID Information Server and a Software Development Kit (SDK) (Sun Microsystems, 2006a). The RFID Event Manager is a Jini-based event management system that facilitates the capture, filtering and eventual storage of events generated by RFID readers. The RFID Management Console provides a browser-based management interface, which allows configuration of various attributes and parameters of the middleware. The RFID Information Server is

responsible for storing and querying the EPC-related data; it also manages inter-enterprise handling of the data. The SDK provides a development platform to build custom applications (Sun Microsystems, 2006 a).

The Sun middleware exposes the hardware as logical readers to the application. These logical readers may be a collection of one or more physical readers that the application can select and apply the various processing parameters to the group (Sun Microsystems, 2006 a).

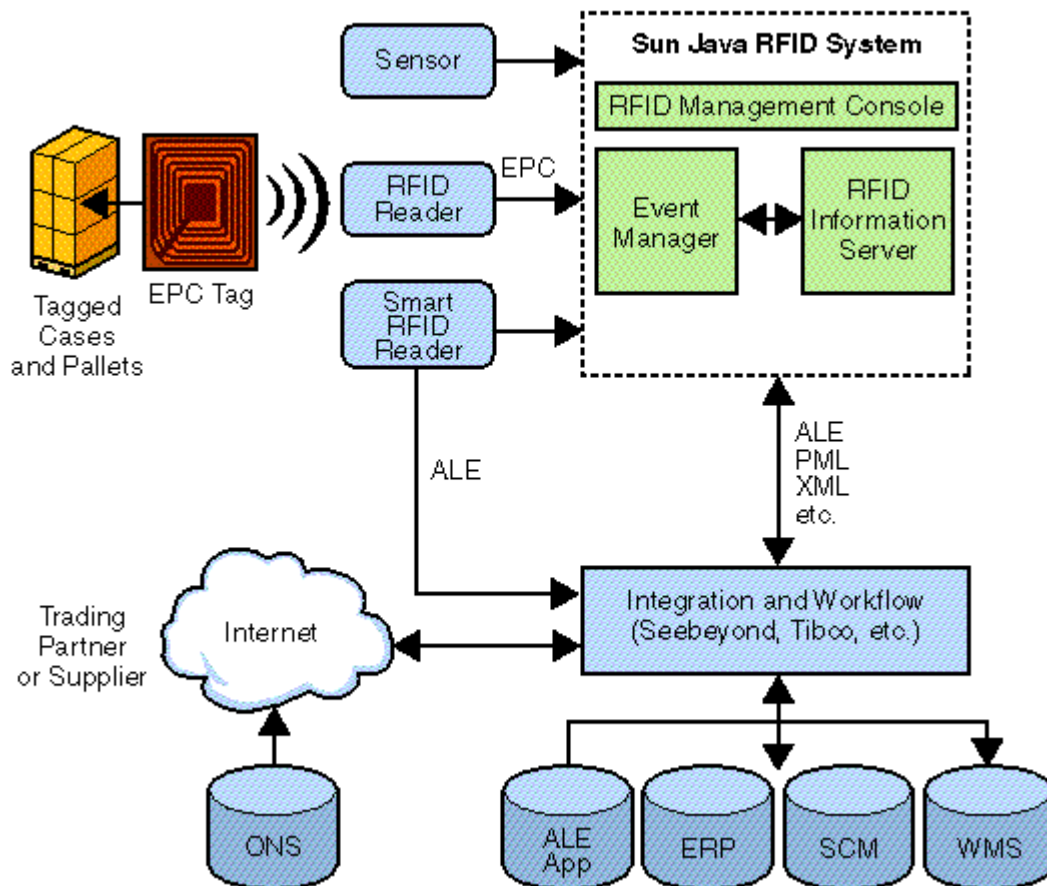


Figure 2.2 The IBM sensor and actuator solutions framework

Source: Eisma (2008)

2.7 RFID applications

The RFID technologies used in different industries will be discussed briefly in this section.

2.7.1 Supply chain management

In the 1970s, SCM technology was limited to simple information processing procedures, customised forms and innovative warehouse management techniques. RFID allows data to be

stored wirelessly and retrieved automatically. It also provides a significant improvement over barcode technology in identifying, tracking and stocking objects. This new technology helped to improve specific processes in logistics and inventory management (Reyes, et al. 2013: 1). RFID innovations are used in industries like logistics (Ngai, Poon, Suk & Ng, 2009a, b) Li et al. (2010) confirm that, looking beyond the 2000s, the application of RFID technology as a supply chain knowledge management “tool” to improve and control supply chain coordination, promises a variety of performance benefits in the coming years. The view of Lit et al. (2010) is that companies involved in the transportation of goods depend largely on such robust information systems for location accuracy. The monitoring of the movement of goods or cargo from one place to another serves as a deterrent to pilferage, which is synonymous with the logistics industry. RFID is a proven technique for tracking essential information about objects as they travel through the supply chain. The information tracked can be utilised to efficiently operate the supply chain. Effective management of the supply chain translates into meaningful competitive advantage for the firms involved (Piramuthu, 2008:9).

2.7.2 RFID in healthcare institutions

Wickramasinghe, Geisler and Schaffer (2005) highlight that although healthcare is a growing industry, it faces many complex challenges in trying to deliver safe, cost-effective and high-value health care. The study proposed that the architecture of an RFID-based health management system (RHMS) for the healthcare sector would help support patient safety, including the safe use of medication, pharmaceutical inventory operations and controls, patient identification and in-hospital location tracking processes. The study by Ahsan, Shah and Kingston (2009:244) presented a generic model of knowledge asset capturing for healthcare using mobile technology. According to Ahsan et al. (2010:247), designing RFID solutions and applications in a healthcare scenario is a very difficult task due to the complex nature of such organisational settings at hospitals, combined with sensitivity of human involvement. Fisher and Monahan (2008) indicate that many hospitals have begun to adopt RFID applications to track inventory, identify patients and manage personnel. In particular, RFID innovations have been used to track medical equipment to minimise search times, verify patient identification to avoid medical errors and collect data on workflow to find inefficiencies in current hospital operations.

2.7.3 *RFID in libraries*

Butters (2008:198-199) states that RFID technologies may be used in a way that replaces traditional barcodes for the storage of item identification and other data. Staff and library users are able to interact with library materials in ways that enhance efficiency and reduce the repetitive handling of materials. The library applications employ smart labels with adhesive backing and memory capacities that are sufficient to store the item identifier, usually equivalent to the barcode number, together with other information required such as the institutional identifier, media code or call number (Fisher & Monahan, 2008). RFID technology offers libraries many solutions that enhance efficiency in circulation and security, thereby freeing staff to provide increased information and intellectual support to patrons/clients.

RFID helps to mitigate the frequency of repetitive stress injuries, as it ensures that materials are back on the shelves faster. In addition, the use of RFID enhances the privacy of library users because users can self-issue and self-return borrowed materials and time and money can be saved using the RFID inventory system (Howard & Anderson, 2005:29). RFID technologies provide material flow management similar to library circulation. RFID technologies also provide services such as assistance in searching and orientation based on the detectable character of RFID (Bhuptani & Moradpour, 2005). These RFID technologies can provide real-time, accurate information, which enables library users to access the right information faster as compared to the use of manual cataloguing systems, which may not be up to date (Ken, 2005). The use of RFID technologies helps to increase interaction between library users and information professionals.

Ghazali et al. (2012) emphasise that among the array of innovative ICTs, RFID technology can be considered a major innovation with the potential to offer many new opportunities to companies to improve communication, facilitate teamwork, improve information management skills and encourage greater cross-fertilisation between business processes. An RFID system has the potential to improve real-time document and material tracking and control (Bhuptani & Moradpour, 2005). Real-time tracking of library documents and materials is a major challenge faced by academic libraries. Information professionals are not able to produce the accurate location of documents or materials in the supply chain network and RFID would be a welcome approach that also assists management in making decisions informed by accurate information. Yahia (2010:107) opines that RFID improves the management, sharing and

transfer of knowledge and fosters collaboration through integrated document management, prompt issue management, risk management and efficient decision-making.

2.8 RFID as an enabler of knowledge management

With reference to all the literature discussed above, it is imperative to uncover how RFID works with knowledge management. Mostert and Snyman (2003) state that successful organisations are knowledge-creating organisations which produce, disseminate and embody new knowledge in new products and services, and find ways to better deliver those products and services for the growth of the organisation. The views of Mostert and Snyman (2003) signify that there are various tools, technologies and systems closely linked to KM. It is evident that RFID technologies embody the intricacies required in an academic library to advance knowledge management.

The use and adoption of KM is designed to enhance efficiency in organisations. In the past, economies depended on natural resources like minerals as sources of income. Wang et al. (2001) explain that in today's knowledge economies, organisations are using organisational knowledge to leverage organisational assets and create value from it. In the knowledge economy, knowledge has become the basic form of capital. Economic growth is driven by the accumulation of knowledge. Knowledge is used in organisations to make money. There are many different definitions of knowledge as formulated by different scholars. Some have identified knowledge as understanding based on experience (Allee 1997; Wiig 1998). In organisations it often becomes embedded not only in documents or repositories, but also in organisational routines, processes, practices and norms. Rather, knowledge depends on tapping the tacit and often highly subjective insights, intuitions and hunches of individual employees and making those insights available for testing and use by the company as a whole. To create new knowledge means quite literally to re-create the company and everyone in it in a non-stop process of personal and organisational renewal.

2.8.1 Types of knowledge

Polanyi (1962) and Nonaka and Takeuchi (1995) concur that knowledge has been categorised into tacit and explicit. Explicit is codified knowledge, while tacit is personalised knowledge (Kok, 2003).

2.8.1.1 Explicit knowledge

In their attempt to distinguish between tacit and explicit knowledge, Nonaka and Takeuchi (1995:8) define explicit knowledge as knowledge that can be expressed in words and numbers and can be easily communicated and shared in the form of hard data, scientific formulae, codified procedures or universal principles. Nonaka and Konno (1998:43) point out that explicit knowledge can be transmitted between individuals formally and systematically. Explicit knowledge can be found in an organisation's knowledge bases in the form of policies and procedures, reports and information systems. With reference to Nonaka and Konno (1998), RFID systems fall within the continuum of information systems that store or process explicit knowledge. According to Kidwell, Van der Linde and Johnston (2000:29), explicit knowledge is documented information that can facilitate action. Explicit knowledge is packaged, easily codified, communicable and transferable, and it can be expressed in formal shared language. Chigada (2014) states that explicit knowledge refers to knowledge in organisations and companies found in systems and processes. In universities, explicit knowledge is found in records and documents and other information sources. However, there may be challenges in accessing explicit knowledge if there are no systems or processes that facilitate access. The Unisa library possesses explicit knowledge. Students, staff and researchers utilise the academic library for reference purposes or for information sources, among other things.

Explicit knowledge can be shared in the form of data, scientific formulae, manuals and specification and can be expressed in words and numbers. This type of knowledge refers to the created or generated research and the output by organisations and research centres (Kidwell et al., 2000: 29). Scholarly knowledge output from universities and research institutes forms part of the institutional repositories with the role of preservation and dissemination of scholarly outputs. Consequently, libraries are designed to provide such knowledge and to access and institute seamless solutions at minimal costs. Scholarly knowledge can be accessed free via open source or other common creative initiatives, or fee-based sources, depending on licensing and copyright agreements between parties. The challenge that universities are faced with is the lack of systems that can capture, store or help retrieve organisational memory. This challenge could be mitigated through the use of RFID technologies, which have built-in capabilities to track, trace and produce information for users and information professionals and management.

2.8.1.2 Tacit knowledge

Tacit knowledge is knowledge residing in the minds and cultures of people, as well as the organisation's experiences (Rowley, 2003). Irick (2007) defines tacit knowledge as personal, internal or interior knowledge deeply rooted in an individual's experiences, ideas, norms and values, and emotions. Tacit knowledge is difficult to put into words because it is highly personal and hard to communicate to or share with others (Jain, 2009). One important aspect of tacit knowledge is that expertise rests on it, which makes tacit knowledge a competitive advantage. Luen and Al-Hawamdeh (2001) view tacit knowledge as knowledge possessed by individuals and communities that is optimised through the creation of communities of practice that can hold, share and grow tacit knowledge. The librarians, cataloguers and all library staff (professional, semi-professional, para-professional or non-professional) possess the requisite knowledge regarding information resources available in the library.

Jain (2009) is of the view that tacit knowledge can be achieved through face-to-face meetings, teleconferencing and electronic discussions, while Nonaka and Takeuchi (1995) feel that tacit knowledge can be transmitted through social interactions between individuals – that is, through the socialisation component of the SECI model. Through dialogues, discussions, experience sharing and observation, tacit knowledge is amplified at group or organisational level. One would then ask, “How is this tacit knowledge retained by organisations?” Nonaka and Takeuchi (1985) argue that, in this way, there will be little risk that the expertise of the university leaves when the employee retires.

Unlike explicit knowledge, tacit knowledge is dynamic and fast changing, so it is knowledge in action. Fombad (2009) states that tacit knowledge is more important and, generally, of a higher value than explicit knowledge because of its fast-changing nature, since it can determine to what extent companies will be competitive in a turbulent market. Literature proves that there is agreement among renowned researchers that tacit knowledge is the most important type of knowledge that exists in organisation (Tiwana, 2008) because it can be put to action and used in innovation and creative practices, thus adding value to goods and services. Tacit knowledge represents knowledge based on individuals' competences, experiences and skills of employees (Jacobs & Roodt, 2007). Organisations need both tacit and explicit knowledge as competitive advantage, but the creation, sharing, capturing and retention of knowledge is greatly influenced by the prevailing knowledge management practices in the organisation.

2.9 Data, information and knowledge

It is necessary to define and understand the differences between data, information and knowledge, particularly when the environment in which the study was conducted is considered; in this case it is an institution of distance learning (Chigada, 2014). There is the misunderstanding that the three terms data, information and knowledge mean the same thing, yet these terms are distinct from, and yet dependent on, each other.

2.9.1 Data

Davenport and Prusak (1998:2) define data as “a set of discrete, objective facts about events. In an organisational context, data are mostly described as structured records of transactions. Modern organisations usually store data in some sort of technology system by departments such as finance, accounting, and marketing.” According to Wang et al. (2001:38), “data is a set of independent, isolated facts, measurements, characters, numerical characters and symbols”. Data are raw and often overabundant. But data are important to organisations largely because it is essential raw material for the creation of information (Davenport & Prusak, 1998:3).

2.9.2 Information

When data have been processed and presented in some form, it is called information, because anyone can now use it and make some sense out of it. Information is the result that people obtain after the process of gathering, organising, adjusting and analysing the raw data. The purpose of the information process is to make raw data become a structured, ordered and related product (Wang et al., 2001:40). Davenport and Prusak (1998) look at information as data that make a difference. Information has a sender and a receiver, is meant to change the way the receiver perceives something and have an impact on his judgement and behaviour.

2.9.3 Knowledge

Knowledge is an important aspect of an organisation, hard as it may be to contextualise and put into perspective. The reason knowledge is difficult to contextualise is because it is fluid. Knowledge is the experience that people have by virtue of doing their work. As workers, everyone in an organisation has experience depending on their expertise. This experience provides a historical perspective from which to view and understand things. From this experience, knowledge develops. This knowledge can be used to make wiser decisions about strategy, competitors, distribution channels, products and service life cycles in organisations (Davenport & Prusak 1998).

Davenport and Prusak (1998:5), well known for their contribution to the field of knowledge management, define knowledge as:

a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms.

Nonaka and Takeuchi (1995) perceive knowledge as “the wealth of beliefs, presumptions that are shared typically within a cultural group (nation, company, family) and are not commonly articulated as they are assumed to be familiar to all.” Knowledge is a combination not only of data and documents, but of information, expert opinion and judgment, skills, and human experience (Ward 2007:18). Others, like Wang et al. (2001), regard knowledge holistically, to be present in ideas, judgements, talents, root causes, relationships, perspectives and concepts. They consider knowledge to be stored in the individual brain or encoded in organisational processes. With reference to the distinction between data, information and knowledge, it is clear that raw facts (data) do not convey any meaning, therefore systems such as RFID are required to capture and process this data into usable facts (information). The presence of information gives birth to organisational knowledge assets (Chigada, 2014).

2.10 Knowledge Management Practices

In the rapidly changing economic environment, universities are being subjected to more scrutiny more than ever before. The competition is stiff and standards of a certain level are expected to be met in the provision of education, research and innovation. Introduction of KM practices has been suggested as the answer to some of these problems. This is in terms of the utilisation of knowledge to make management decisions to improve internal document management and exploitation to increase the level of knowledge dissemination and the utilisation of knowledge for qualitative change in the provision of information services. Andreeva and Kianto (2012:618) explain that “KM practices refer to the aspects of the organisation that are manipulable and controllable by conscious and intentional management activities”. Knowledge processes naturally exist in organisations irrespective of any management efforts. Knowledge processes involve knowledge creation, sharing, acquisition,

transfer and application. In the university setting, this is practically part of the core business of a university.

2.10.1 Knowledge creation and acquisition

After making clear what the sense of knowledge sharing is, the researchers and scholars are required to develop the sense of creation. Numerous popular researchers have explained that the process of knowledge creation is based on different ways of knowledge sharing among employees. Nonaka (2000:96) defines knowledge creation as the process of making tacit knowledge available. Wai and Jayasingam (2012) explain in their study that a culture of knowledge sharing was found to have a positive influence on knowledge creation. Michell and Boyle (2010) state that knowledge creation entails the generation, development, implementation and exploitation of new ideas between people. Knowledge creation is considered to be an important role of learning and innovation for an organisation's success and survival in the market (Soo, Devinney & Midgley 1999). In addition, organisations or academic libraries require systems to facilitate the creation and / or acquisition of knowledge. Von Krogh, Nonaka and Aben (2000) explain in their study that the knowledge creation process consists of the following activities: sharing tacit knowledge, creating concepts, justifying concepts, building a prototype and cross-levelling the knowledge. The knowledge creation process envisages the use of information communication technologies such as RFID. Nonaka (2000) concurs that knowledge is created through the interaction among individuals and their environment.

2.10.2 Knowledge sharing

Literature has revealed that scholars within the area of knowledge transfer have different understandings and opinions of the meaning of knowledge transfer. Knowledge sharing in organisations is becoming increasingly important and organisations are making major investments to implement KM solutions within their environments. Knowledge sharing in academic libraries or other institutions dictates that management should adopt knowledge sharing technologies such as RFID technologies. Chigada (2014:62) states that knowledge sharing platforms help organisations integrate vast assortments of disparate applications which enable information sharing while creating a centralised knowledge management approach across the organisation. Collaboration technologies support virtual meetings, subject expert repositories, image galleries, instant messaging, wireless web services, training and e-mail management (Hedgebeth, 2007:51). The application of RFID discussed earlier in this chapter

supports the views by Hedgebeth (2007) on the importance of knowledge sharing platforms. Notwithstanding the Sun Java RFID system discussed earlier, there is no better way of sharing knowledge and information about information resources in a library than using RFID technologies which are real-time online systems.

2.10.3 Knowledge retention

Kim (2005) defines knowledge retention as all systems and activities that capture and preserve knowledge and allow it to remain in the organisational system once introduced. The knowledge and expertise from employees should be retained before they leave the organisation. In the absence of knowledge retention strategies, organisations lose tacit knowledge because of all kinds of attrition, such as when employees leave to go to other organisations. Becerra and Fernandez (2004) state that organisational culture reflects beliefs and norms that guide the behaviour of the members of the organisation. The knowledge held by experienced and expert workers needs to be captured and retained for the continuity of the organisation/s and it is important for the organisation/s to develop strategies to prevent the loss of knowledge. The awareness of knowledge loss through staff attrition is prompting companies to institutionalise certain processes to capture as much knowledge from their employees as possible (Chigada, 2014:51). The use of KM solutions such as RFID should be considered for the purpose of preserving organisational knowledge assets. Academic libraries lose corporate memory in various ways and it is sometimes difficult to detect the loss, as there are no systems to help track and combat knowledge loss. In this study, the researcher seeks to establish how RFID technologies can be used as KM enablers in academic libraries. RFID systems have capabilities to retain information and interact with other systems while sharing information. RFID systems are scalable and are integrated into enterprises resources planning (ERP) systems.

2.10.4 Knowledge dissemination

Explicit knowledge within the university can be considered as easily transmittable, whereas tacit knowledge is more complex and requires more of an effort to be shared and transmitted to others (Laoufi et al., 2011). As such, some studies have indicated that it is important to have a knowledge management system in such an environment for efficient and timely transmission of knowledge (Arntzen et al., 2009). The term knowledge management system (KMS) refers generally to a system for managing knowledge within organisations. RFID systems play a pivotal role in information dissemination situations.

2.11 Benefits of knowledge management

Authors like Arntzen et al. (2009), Wamundila and Ngulube (2011), Bhusry and Ranjan (2012), Chigada (2014), Rowley (2001), Tikhomirova et al. (2008) and Al-Oquily et al. (2014) in their studies agree that there are numerous benefits experienced by organisations that have KM practices in place. For the Unisa library and the university as a whole, it has the following benefits:

- Improved sharing of internal and external information to minimise redundant efforts and lessen the reporting burden
- Shared knowledge from a variety of constituents to begin to create a “learning organisation” which is responsive to market trends
- Improved effectiveness and efficiency of library services
- Improved compliance with administrative policies such as procurement, preferred vendors, procurement card policies, budgeting procedures and affirmative action guidelines
- Improved services for students, researchers’, academics and staff
- Improved record-keeping and document management services
- Reduced turnaround time for research, inventory management, re-order levels and Just-In-Time [JIT]. JIT systems are widely used to manage the delivery processes of stock of information resources
- Facilitation of interdisciplinary research of previous research and proposal efforts
- Reduced administrative costs
- Well-resourced library that has the latest information sources
- Collaboration between academic libraries through the use of RFID technologies

2.12 Other knowledge management enablers

The other KM enablers are:

2.12.1 Organisational culture

Nahavandi et al. (2015:478) explain that organisational culture is the culture that exists in an organisation. It is made up of values, beliefs, assumptions, perceptions, behavioural norms, artefacts and patterns of behaviour. It allows the organisation to control the behaviour of its members informally by setting norms. Effective implementation of KM practices requires organisational cultures that enhance efficiency, productivity, innovation and service. The

traditional cultures of universities are a hindrance to knowledge sharing and management. Unlike the corporate world and the existing culture of knowledge sharing and knowledge management, notions of a corporate culture are very much secondary to the reality of a university as a collection of sub-cultures. Furthermore, loyalty to their discipline hinders the process of knowledge sharing and knowledge management (Ratcliffe-Martin, et al., 2000). Kidwell et al. (2000) argue that the embracing of KM in institutions of higher learning is dependent on the culture, beliefs, values, norms and behaviours that are unique to an organisation. The authors state that universities are moving away from a culture of “what’s in it for me?” to a new culture that asks “what’s in it for the customer?” The Unisa library organisational culture should be accommodating and should enable the adoption of KM as part of its strategy. Cultures that do not allow enabling environments tend to stifle innovation.

2.12.2 Organisational structure

The structure of the organisation has a resultant effect on how knowledge practices may be implemented in organisations. Depending on how the structure of the organisation is arranged, the workers are linked in such a way that they are encouraged and motivated to share tacit knowledge. There are different types of organisational structure, such as hierarchical, flat and autocratic organisations. Organisational structures should allow the sharing, acquisition and creation of knowledge. The Unisa library runs on a flat or top-down structure, which is problematic because there are less opportunity for top management to acquire knowledge from their subordinates.

2.12.3 Human capital

In organisations, the term ‘capital’ usually refers to money as the capital of that organisation to spur on the activities of that organisation. However, in KM, we talk about human capital which also plays a critical role for the organisation. The level of skills deficiency may create problems for the academic library as an organisation because employees may not be able to comprehend new technologies or systems. The introduction of RFID systems in academic libraries may be resisted by employees for fear of the unknown. Human capital is the knowledge, expertise, skills or characteristics of the worker that contributes to the productivity of the organisation. This human capital brings about competitiveness in organisations and as the competition for talent continues, organisations around the world are trying to figure out alternatives to hierarchical organisational structures, for example, which do not necessarily promote knowledge exchange (Morgan, 2015)

2.12.4 Leadership

Every organisation needs leadership. In organisations, leaders help to steer the organisation in the right direction to achieve its intended goals and objectives. In the university setting, leadership is imperative. Leadership helps to create and instil the right morale and environment for the implementation of knowledge management practices.

2.12.5 KM systems

Therefore, a knowledge management system is the structure required for creating dynamic organisations for learning, resulting in rapid responses to the changing business environment, continuous improvement and innovation, and improved bottom-line results (Wang et al., 2001:265). System requirements for KM systems to be implemented effectively are the internet and web technology, database technology, communication technology and software technology. Alavi and Leidner (2001:114) define a knowledge management system as a “class of information systems applied to managing organisational knowledge. That is, there are IT based systems developed to support and enhance the organisational processes of knowledge creation, storage/retrieval, transfer, and application.”

That is to say, KM systems aid the implementation of KM practices. Furthermore, in their analysis of literature, Alavi and Leidner (2001) show that the application of IT to organisational KM initiatives reveals three common applications:

- the coding and sharing of best practices
- the creation of corporate knowledge directories
- the creation of knowledge networks.

In the current study, there is a dearth of information suggesting the existence of formal KM systems in the Unisa library. Attention is focused on the viability and efficiency of the library, yet, in the current information and knowledge dispensation, organisations, including academic libraries, are developing KM systems. Knowledge has become a more important organisational asset than the traditional assets that business environments focused on in the past (Chigada, 2014). The existence of KM systems is in line with overall organisational KM strategy and vision. It would too much to expect the Unisa library to have such systems if the university, as a whole, does not have a KM vision, let alone that its faculties tend to operate in silos.

2.13 Empirical studies on the application of RFID

The growing use and application of RFID technologies cannot be over-emphasised. It is a widely known fact that the construction industry represents one of the key industries contributing to worldwide economic growth (Mastura et al., 2007). The industry relies on a wide array of technical, professional and specialised services (Ergen et al., 2007). Construction projects face some critical challenges, namely, cyclical demands, the fluctuating costs of materials, a significant number of changed orders per project and a rather authoritarian environment based on the chain of command. One of the most serious challenges concerns the so-called “silos” or “islands of information” due to the various software applications used by different professions such as surveying, architectural design and engineering. Among the array of innovative ICTs, RFID technology can be considered as a major innovation with the potential to offer many new opportunities for construction companies to improve communication, facilitate teamwork, improve information management skills and encourage greater cross-fertilisation between business processes (Bowden et al., 2005).

A study was conducted by Ghazali et al. (2012) to identify information systems that can enhance KM in construction firms. A quantitative research methodology was adopted in this study. The study explored procurement activities in one construction industry’s supply chain and revealed that RFID is positioned as “an emergent technology for real-time tracking of any product, module, system and, eventually, any component as they move along the various layers of supply chains.” Bendavid (2009) and one of today’s “fastest growing technologies in terms of scope of application in the next generation of business intelligence” (Chen, Tsai & Liu, 2008). RFID also has the potential to “revolutionise” supply chain processes (Vijayaraman, Osyk & Chavada, 2008), in particular with respect to product recalls and reverse logistics (Bardaki et al., 2007) and reduce supply chain uncertainty. The construction industry can benefit from RFID technology (Ren, Anumba & Tah, 2011). It is perceived as “one of the most anticipated technologies that will supposedly transform processes across the construction and engineering industries” (Goodrum, McLaren & Durfee, 2005:292) and whose integration is becoming appropriate for various construction applications (Wing, 2006).

Collaboration is characterised by “sharing collective skills, expertise, and understanding, in an atmosphere of openness, honesty, trust and mutual respect, to jointly deliver the best solution that meets their common goals” (Wilkinson, 2005:3). In a supply chain context, inter-organisational collaboration is crucial (Mentzer, 2001) and the gains from such collaboration

are derived “from the opportunity to access new markets, new technologies and new skills, to reduce operational costs and product time to market, and to optimize overall supply chain performance” (Eisenhardt & Schoonhoven, 1996:137). Collaboration emphasises information exchange, integration and durable commitment (Henttonen, Pussinen & Koivumäki, 2012) where the management of intellectual capital and its related knowledge are perceived as the nucleus of the supply chain’s effectiveness and the basis of its operations (Hansen, 2002).

Another study by Veisheh and Monfared (2015) focused on how RFID is an enabler of maintenance management. A quantitative research methodology was used where data were collected through random sampling to track information related to components (supply chain management). Efficiently tracking information related to components, materials and equipment from the production/construction phase to operations and maintenance is a challenge in the industries. Advanced electronic identification and data storage technologies, such as RFID, are used to identify equipment automatically and integrate related information with equipment in various industries. The study revealed that the use of RFID can extend beyond the needs of asset management. Engineers are afforded the ability to reference and update a part’s maintenance history more quickly and easily, which facilitates accurate configuration control and repairs, and thus reduces warranty claim processing costs. Benefits even extend to accurate and efficient spare parts pooling and easier identification of rogue parts. The ability to accurately track movable assets eliminates the frustration of having to physically locate them and helps avoid unnecessary JIT purchases when ‘missing’ assets are assumed to have been disposed of. By placing RFID tags on the assets and readers at key entry and exit points and various other locations, movable assets will be automatically tracked and located in real time (Conneely, 2009). Technologies, methodologies and tools aimed at maintenance are continuously being developed and improved.

The widespread use of RFID could automate the tracking of pallets, cases, individual products, as well as reusable assets such as bins and containers throughout the supply chain. With RFID, the collection of real-time data on individual items could become a reality, which was not possible with the use of bar codes. A future vision of RFID includes the “Internet of Things,” which refers to a global network of computers and objects in which computers are able to identify and store information on any object, anywhere in the world, instantly (Teresko, 2003) RFID is believed to offer many benefits in supply chain management, including shrinkage reduction, material handling efficiency, increased product availability and improved asset

management (Taghaboni-Dutta & Velthouse, 2006). With the empirical discussions and studies presented, there is ample evidence that RFID technologies are there to stay and transform the knowledge management space.

2.14 Chapter summary

In conclusion, this chapter reviewed the existing literature on RFID and knowledge management and how RFID technologies are applied in various functional areas and sectors. An overview of RFID architecture and components, as well as how RFID is an enabler of KM formed part of the key discussions in this study. The second part of the chapter provided a synopsis of KM, KM practices and KM enablers. It was imperative to distinguish data from information and knowledge as these three terms are misconstrued to mean the same and are quite often used interchangeably. The literature reviewed showed that the application of KM practices with the right processes in place does have a positive impact on organisational performance. Empirical studies on RFID have revealed that RFID is here to stay and has transformed business processes for the better. The academic library deals with many supply chain management issues which require accurate and prompt information for decision-making. The use of RFID technologies will help library management to improve service delivery, cataloguing, inventory management and support KM. It was paramount to review the literature so as to ascertain what research methodologies and sampling strategies were used to arrive at the various findings. It was revealed that RFID technologies are effective KM enablers used for collaboration between firms in the same industries and for supply chain management knowledge and information sharing. The research methodology used to collect, analyse and interpret data for this study, is presented in the next chapter.

CHAPTER THREE: RESEARCH METHODOLOGY

I want to understand the world from your point of view. I want to know what you know in the way you know it. I want to understand the meaning of your experience, to walk in your shoes, to feel things as you feel them, to explain things as you explain them. Will you become my teacher and help me understand? (James Spradley, 2010)

3.1 Introduction

In the previous chapter, a critical literature review relating to the use and application of RFID as an enabler of KM was presented. In this chapter, the research methodology and design adopted for the present study are discussed. Prior to choosing an appropriate research paradigm, the research topic, with corresponding research questions, was formulated. The research paradigm is a worldview that helps one to generate the research plan. The research methodology is an integral part of any research because it provides the guidelines for collecting, analysing and interpreting research data. Relevant research should be collected to address the problem being investigated. To carry out this study, the researcher had to understand what was being investigated. This helped the researcher to develop the ideal process for carrying out the study so as to generate new knowledge (Saunders et al., 2012:178). Research is the process of undertaking or carrying out an original investigation in all its forms: analysis, innovation, experiment, observation, intellectual enquiry, survey, scholarship, creativity, measurement, development, hypothesis, modelling and evaluating with a view to generating new knowledge or novel comprehension (Bushaway, 2009:161). Research may be identified as applied or basic. According to Powell and Connaway (2014):

Basic research tends to be theoretical in nature and concerns itself primarily with theory construction, hypothesis testing, and producing new, generalisable knowledge. Applied research tends to be more pragmatic and emphasizes providing information that is immediately useable in the resolution of actual problems, which may or may not have application beyond the immediate study.

Leedy and Ormrod (2010:219) believe that the applied and basic research categories complement each other. Sharing similar views, Argyris (2013:6) suggests that the distinction between basic and applied research should be reformulated by showing how basic research contributes to applied research.

3.2 Research Paradigm

Before conducting any research, it is important for the researcher to formulate the research topic, followed by corresponding research questions. The concept of RFID technologies as enablers of KM was discussed within the interpretivist paradigm. In this study, the research topic was developed first and then appropriate research questions were formulated in line with the research topic. The importance of formulating the research topic was to ensure that an appropriate research worldview was identified and used in the study. The research paradigm helped the researcher to know and understand the phenomenon under investigation (Saunders et al., 2012). When conducting research projects, researchers may place their studies within pragmatic, positivist or interpretivist paradigms. Positivism is informed by the objectivist epistemological stance; interpretivist, is influenced by a subjectivism epistemology, and the pragmatic paradigm, combines both positivism and interpretivist paradigms (Chigada (2014:121). In the present study, the research topic was an investigative type of topic, that is, the study was exploratory in nature; therefore, it was imperative to identify and adopt the interpretivist paradigm. The objective of using the interpretivist paradigm was to collect and contextualise data to a natural setting. The Unisa library was the phenomenon from whom data were collected and contextualised. The researcher collected data through interviews, thus, immersion with respondents during data collection was inevitable. In order to understand how this research was conducted, an appropriate research design was used in this study.

In Table 3.1 below, Creswell (2010:387) contrasts quantitative and qualitative paradigms across several dimensions, namely: ontological, epistemological, axiological, rhetorical and methodological assumptions. From an ontological perspective, quantitative theorists assert that reality is objective and the researcher is independent from that which is being researched, while from a qualitative viewpoint, reality is subjective and the researcher interacts with participants. The qualitative process is inductive, while a deductive process is followed in the quantitative methodological assumption.

Table 3.1 Quantitative and qualitative paradigm assumptions

Ontological assumption	What is the nature of reality?	Reality is objective and singular, apart from the researcher.	Reality is subjective and multiple as seen by participants in a study.
Epistemological assumption	What is the relationship of the researcher to that being researched?	Researcher is independent from that being researched.	Researcher interacts with that being researched.
Axiological assumption	What is the role of values?	Value-free and unbiased	Value-laden and biased
Rhetorical assumption	What is the language of research?	Formal, based on set definitions, impersonal voice, use of accepted quantitative words.	Informal, evolving decisions, personal voice, accepted qualitative words.
Methodological assumption	What is the process of research?	Deductive process, cause and effect, static design categories isolated before study. Context free, generalisations leading to prediction, explanation and understanding. Accurate and reliable through validity and reliability.	Inductive process, mutual simultaneous shaping of factors, emerging design categories identified during research process, context bound, patterns, theories developed for understanding. Accurate and reliable through verification.

Source: (Creswell, 2010)

3.2.1 Positivist paradigm (Quantitative)

Creswell (2012) states that a positivist approach is the traditional quantitative approach to social and educational research, while Creswell (2012) opines that the research strategies generally fall within a continuum of possibilities between positivism, which is quantitative, scientific experiments, and a traditional approach, which views reality as a concrete structure. In positivist paradigms, during data collection, individual participants voluntarily and freely

provide their opinions and perceptions about the subject under discussion and the researcher is invisible during the survey. This is in line with the epistemological perspective, which states that the researcher is independent from what is being researched. To study something using the positivist methodology, researchers may experiment with careful controls for bias, use a prior theoretical framework and carefully delineate specific variables that can be operationally defined according to standards in the scholarly literature. In the present study, there were no experiments or theories to be tested, therefore, the positivist approach was not considered.

3.2.2 Phenomenological research (Interpretive)

The goal of this type of research is to describe the research and explore a life experience. The use of RFID technologies as KM enablers was explored in relation to the Unisa library. In this type of research, narrative material is analysed using qualitative methods. Interpretivists prefer to see the world in quite a different way, requiring a different response from researchers. Bryman and Bell (2007:01) state that: “Interpretivists are of the view that the subject matter of the social sciences, people and their institutions are fundamentally different from that of the natural scientists.” The study of the social world therefore requires a different understanding of research procedure. This different logic within an interpretive approach might provoke a researcher to use inductive theory construction. This will reverse the deductive process by using data to produce theory. Using elements of psychology to analyse data, this type of research was appropriate for this study. Based on the above-mentioned information, the researcher can conclude that there are several research methodological options and sometimes it may be difficult to determine which method to use. This study has the characteristics of qualitative research, therefore the researcher’s decision to pursue this path.

3.3 Research design

The design is the complete strategy of attack on the central research problem. It provides the overall structure for the procedures that the researcher follows, the data that the researcher collects and the data analyses that the researcher conducts (Leedy & Ormrod, 2001:91). It is ‘the specification of the most adequate operations to be performed in order to test a specific hypothesis under given conditions.’ There are many types of research designs which can be applied to different types of research like case studies, quasi-experimental designs and experimental designs (Burton et al., 2008)

Ngulube (2010) states that there are various research designs available for research projects. A plan of action for collecting data to address research question is referred to as a research design (Creswell, 2012). Common research designs synonymous with quantitative research include: causal comparative, explanatory research designs, which are used to determine the causal relationships between two or more variables. Descriptive and correlational research designs are not the same as causal-comparative research designs. All these three research designs allow a researcher to use experiments, surveys or case studies to collect data, which will be presented and analysed statistically or mathematically (Van Wyk, 2012:23). Descriptive research designs may be used in quantitative and qualitative research projects because one will have the ability to present data in numerical format or through expressions describing statistical information. With reference to the research topic and the nature of study, the exploratory research design was opted for and used in this study.

In this study, the exploratory research design was used because the intention was to address the “what if?” type of research question. The exploratory research design was appropriate in this study because it is the most useful (and appropriate) research design for those projects that address those subjects about which there are high levels of uncertainty and ignorance, and when the problem is not very well understood (that is, very little existing research on the subject matter). The subject of RFID technologies in academic libraries was not well understood, nor did the Unisa library management plan for the implementation of systems such as KM enablers. This present study was characterised by a high degree of flexibility while the research lacked a formal structure (van Wyk, 2012:23). Respondents were free to respond in their own words without limitations, which is not possible in other research designs. Other research designs compel respondents to choose one option from a set of choices. The main aim of this exploratory research was to identify the boundaries of the environment in which the problems, opportunities or situations of interest resided. In addition, the salient factors relevant to the study were also investigated in this study. During data collection, the formal approach was to design the research instrument interview guide, which provided a boundary for what was asked.

3.3.0A research strategy is a plan of action adopted when collecting data from a phenomenon (Saunders et al., 2012:139). Using a specific research strategy allows one to investigate, collect and contextualise data to a natural setting. In this qualitative study, a qualitative research strategy was used. It was easier to adopt the qualitative research approach after development of the research topic, followed by commensurate research questions. It is important to clarify the distinction between the quantitative and qualitative research approaches.

3.4 Research Methodology

3.4.1 Quantitative

When a study is carried out by using the quantitative approach, the researcher will be pursuing a scientific approach or experimental approach. The collection of data is done by means of questionnaires, doing experiments and testing hypotheses (Pellissier, 2008:15). The presentation of results is depicted by numerical, graphical and other scientific means. There is minimum discussion in scientific research. The quantitative research falls within the positivist paradigm. Quantitative research is then used to answer questions about relationships among measured variables with the purpose of explaining, predicting and controlling the phenomenon (Leedy and Ormrod, 2010:93). In this study, the units of analysis were research questions, which envisaged descriptions and explanations of a natural setting; therefore, a quantitative approach was not selected in that instance.

3.4.2 Phenomenological research (Qualitative)

A brief discussion of the qualitative research approach is presented in this subsection. The qualitative research methodology was adopted in this study. Saunders et al. (2012:175) state that the qualitative research approach is informed by the interpretivist paradigm. The open-ended questions designed at the beginning of the study allowed the researcher to adopt and use a qualitative research approach. Data were collected and contextualised to the Unisa Library. When a qualitative research approach is used, the intention is to build theory (Saunders et al., 2012:175). Theory building is the complete opposite of theory testing. Theory was built by integrating the findings from face-to-face interviews. Respondents shared their experiences regarding the use of RFID and all the challenges and successes they had experienced. Personal experiences were shared during face-to-face interviews, thus, the respondents expressed feelings and opinions in their own words without restrictions (Leedy & Ormrod, 2010:218).

One of the benefits of conducting interviews is that they provide another way to acquire, share and create knowledge. In simple terms, on its own, conducting this research was an exercise in knowledge acquisition, sharing and creation. Three KM practices were set in motion in this study; therefore, it is clear that knowledge is the cornerstone of humankind. In this study, the researcher was occupied with the subjects under investigation. Qualitative research emphasises words rather than quantification in the collection and analysis of data and data, expressed in words, contain information about feelings, values and attitudes (Babbie, 2010: 35). According to Leedy and Ormrod (2010:135), the qualitative research method does not allow the researcher

to identify the cause-effect relationships and to answer questions like, “What caused what or why did this happen?” In such cases, quantitative research is more applicable than qualitative research. The limitation to this study was the time and cost associated with the development of simulators to test ‘what if’ scenarios. Simple simulation would not be sufficient to cater for all the actors and variables involved.

3.4.3 Justification for using qualitative research methodology

The research questions adopted in the present study informed the adoption and use of the qualitative research approach. The questions were open ended, thus, respondents were able to provide their own opinions in their own words. The other motivation for adopting the qualitative research approach was attributable to the research design that was decided upon when the research plan was generated. An exploratory research design was decided upon; therefore, it was appropriate to use a qualitative research approach. When the interpretivist paradigm has been chosen, it is ideal to adopt a corresponding qualitative research approach (Saunders et al., 2012:176). In addition, the qualitative research approach offered opportunities for engagements and face-to-face interactions between the researcher and research participants. In this study, one engaged and interacted with research participants and asked probing questions, which is not possible in a quantitative research project.

The adoption of the qualitative research approach was informed by the epistemological stance of subjectivism; therefore, it became appropriate to use a qualitative approach. However, it was observed that the use of qualitative research was time consuming and, in some instances, elements of bias were evident during the interviews (Dewah, 2011:146). This abdication approach allowed the researcher to develop inductive inferences (Saunders et al., 2012:163). It was difficult to test the hypothesis in the present study, because the researcher sought to solve the problem by extracting data through face-to-face interviews. The research was exploratory in nature; therefore, it was natural to use a qualitative research approach. The problem under investigation was an objective reality that could be measured through interviews.

The ontological perspective of this study allowed respondents to view the study subjectively. The axiological assumption in qualitative research is that the study is value-laden but susceptible to bias. It should be noted that this study was informal and it integrated evolving decisions, allowing the personal voice of the respondent to be heard. Respondents’ viewpoints were accepted in rhetorical assumption. In addition, this study was inductive, mutual and

possessed simultaneous shaping factors and emerging design categories identified during data collection (Creswell, 2012:387).

3.4.4 Research strategy

The research strategy was to utilise a case study design of the Unisa library. The case study is characterised by placing emphasis on a single study object; although a possibility of investigating multiple units exists. The case study will be convenient for the study, as it will provide meaningful face value credibility for the study findings. As defined by Yin (2003: 13), a case study is “an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.” The suitability of the case for this study is because it covers contextual conditions that are significant to the research phenomenon, namely RFID as an enabler of knowledge management in academic libraries.

The contextual conditions in this case will mainly comprise the organisational environment, which will be examined in relation to the development of RFID technologies and how these technologies can be used to enhance the performance of academic libraries. Therefore, the strategy of a case enhances a practical and appropriate output during the implementation of RFID technologies. A case study is a research design that provides a detailed story of the case study (Hancock 2002:11; Johnson & Christensen 2004:211; Myers 2007:35). There has been an increase in the use of the case study approach, which has been attributed to the fact that it allows for in-depth investigation of a problem. Moreover, the case study will help the researcher to cover contextual conditions that are significant to the research phenomenon. In this case, contextual conditions are environmental conditions in the university’s library in relation to its implementation of RFID technologies and knowledge management processes.

A case study was chosen as the appropriate research strategy for the present study. Saunders et al. (2012:139) define a case study as a strategy for doing research, which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence. Yin (2009:47) indicates that case study research is appropriate when investigators hope to “(a) define research topics broadly and not narrowly, (b) cover contextual or complex multivariate conditions and not just isolated variables, and (c) rely on multiple and not singular sources of evidence.” The case study approach places a great premium on objectivity and reliability of findings and encourages replication of results (Saunders et al., 2012:85), thus supporting the assumption that the researcher is independent

of and neither affects nor is affected by the subject of the study (ontological and epistemological assumptions which are synonymous with the quantitative paradigm).

A case study can be used for such purposes as testing theory, theory development and organisational problem-solving. Apart from providing direction for further areas of investigation, Leedy and Ormrod (2010:175) suggest that the case study is also good for generating hypotheses. Unfortunately, this study did not formulate hypotheses; rather, research questions were developed as the main units of analysis. Due to the limited time scale for this study, the use of the case study approach was appropriate as it allowed for the investigation of particular phenomena to some depth in a short space of time. It is important to tabulate the characteristics of a case study to justify the reasons why this research design was chosen. The key considerations for using the case study strategy are summarised by the following characteristics:

- The case study focuses on contemporary events.
- Case research is useful in the study of “why” and “how” questions.
- The phenomenon was examined in a natural setting.
- One entity or a few entities or persons or a group or an organisation are examined.
- The case study is suitable for an exploration of the knowledge-building process.
- No experimental controls or manipulation were involved in this study.
- The researcher was able to specify independent and dependent variables in advance.

3.5 Target population

Collins and Hussey (2009:62) state that a target population is a group of people or objects under consideration where data are collected. The population may be a group of objects from which a researcher collects data and contextualises to a phenomenon. Babbie (2010:116) defines a population “as the entire set of objects and events, or groups of people, which is the object of research and about which the researcher wants to determine some characteristic.” The target population for this study included library middle management and supervisors, library cataloguing, distribution, information, procurement and the shelving and library technology sections.

The total population for the study consisted of 60 people. Due to the size of the population, it was not possible to include everyone in this qualitative research project; therefore, a sample was selected to partake in this study. The target population for the present study allowed the researcher to collect research data with the intention of addressing research questions. The sample members selected to participate in this study were responsible for the implementation of IT/IS, library staff and users, the procurement committee and decision-makers. Therefore, it was appropriate to collect data from people directly involved in the decisions that affected the issue under investigation. In qualitative research, a sample of between 8 to 12 participants is recommended (Chigada, 2014:175), but for quantitative studies the sample has to be larger than 100 participants to ensure representativeness. But for the purposes of clarity, it is important to discuss the concepts of sampling and the different sampling strategies available to researchers.

3.6 Sampling

Babbie (2010:198) defines the sampling frame as the list of elements from which the probable sample is selected. In this case, the sample elements comprised participants chosen from various units of the Unisa library. Sampling is the collection of a small number of units or elements taken from a larger population or collection; two types of sampling procedures are probability sampling and non-probability sampling. The sample size for the study was 12 participants drawn from various management levels, committees, IT and procurement. These individuals possessed varying degrees of experience and knowledge working in the area under investigation. In addition to possessing experience, the use of ICTs is becoming a topical issue and this sample of participants has worked with different systems within the Unisa library. Face-to-face interviews were conducted with each participant to understand their opinions and perceptions regarding the RFID technologies. In order to select sample members for this study, a non-probability purposive sampling strategy was used. It is imperative to highlight probability and non-probability sampling strategies.

3.6.1 Sampling strategies

Denscombe (2007:14) states that probability sampling includes: simple random sampling, interval or systematic sampling, stratified sampling, as well as cluster or multi-stage sampling. Non-probability sampling, on the other hand, includes the following types of sampling: accidental or availability sampling, purposive or judgment sampling and quota sampling (Denscombe, 2007:14).

For this study, purposive sampling was used for qualitative data collection (interviews). Purposive sampling is a non-probability form of sampling (Bryman, 2006:418). The researcher does not seek to sample research participants on a random basis. The goal of purposive sampling was to sample cases/ participants in a strategic way so that those sampled were relevant to the research questions that were asked during the data collection process. Researchers may opt to use probability or non-probability sampling techniques. Saunders et al. (2012) state that with probability sampling strategies, there is a known and equal chance of being selected, while with non-probability sampling strategies, research participants do not know if they will be selected or not.

3.6.1.1 Probability sampling

Probability sampling is associated most commonly with survey research strategies where one needs to make inferences about a population from the sample in order to answer one's research questions and to meet one's objectives (Saunders et al., 2012:262). With reference to random sampling, sample members are selected through allocation of a unique number that is then randomly selected (Ngulube, 2014). The computer runs and selects numbers randomly. The lottery system mitigates bias because sample members are selected randomly without any prior selection criteria. With cluster sampling, sample members are put into clusters and then selected randomly. The other probability sampling techniques are stratified sampling and systematic sampling. With reference to the discussion that was presented on probability sampling techniques presented, the researcher used personal judgement as to who to include or exclude from the study. Probability sampling techniques were not used in this present study.

3.6.1.2 Non-probability sampling

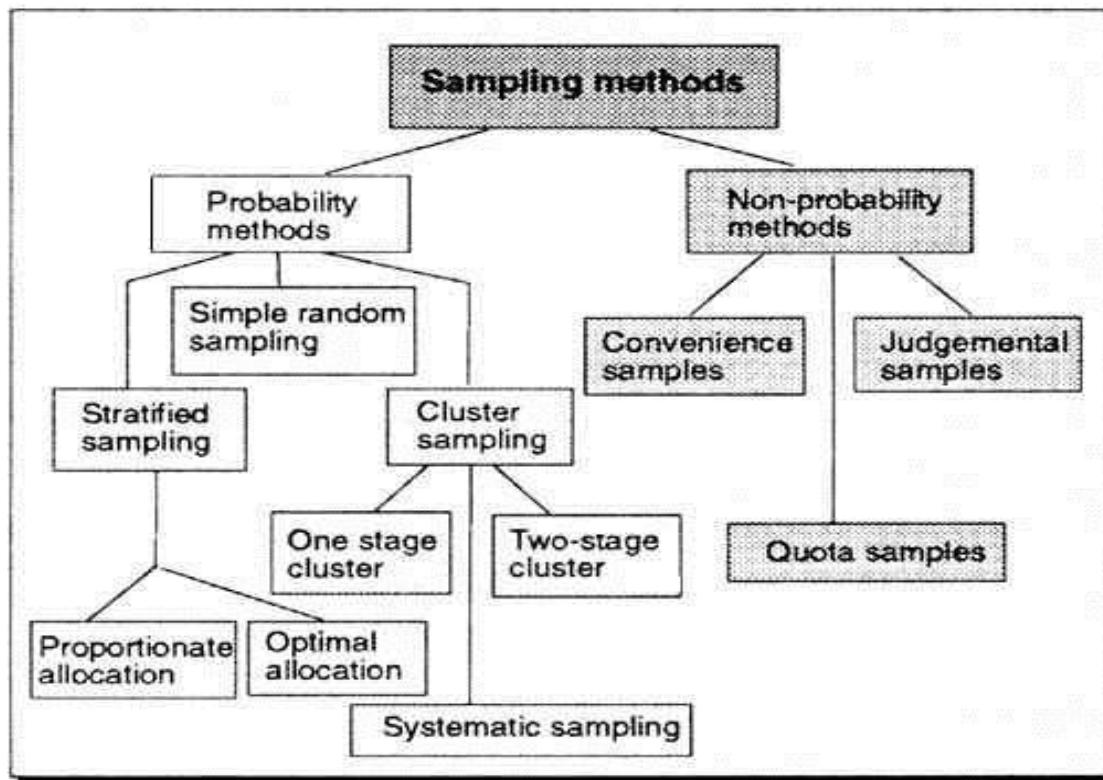
With non-probability sampling, it is the responsibility of the researcher to set some criterion or basis for selecting sample participants (Leedy & Ormrod, 2010:218). Judgemental sampling entails using the researcher's judgement as whom to include in or exclude from a study; convenience sampling entails selection of sample members who are readily available when the study is being conducted. From the data collected, it was easy to identify trends and patterns from respondents' views and experiences relating to the RFID; quota sampling is another non-probability sampling technique, which involves pre-setting criteria for selecting participants. Criteria may include age, years of experience, gender or qualifications. Sample participants are selected on the basis that they satisfy any of the criteria (Saunders et al., 2012:201). Purposive sampling is another non-probability sampling technique where sample members are chosen for

possessing specific data for the research. It should be noted that non-probability sampling does not produce representative samples compared to probability sampling (Chigada, 2014).

In the present study, sample members were selected on the basis of possessing relevant data required to address the problem at hand; therefore, non-probability purposive sampling was used in this study. Most of the sample members selected for this study possessed knowledge and experience in the area under investigation; therefore, data collection was easier. Kumar (2005:179) states that the use of purposive sampling is determined by “the judgement of the researcher as to who can provide the best information to achieve the objectives of the study”. This assertion by Kumar (2005) is corroborated by Leedy and Ormrod (2010:145), as well as by O’Sullivan, Rassel and Berner (2008:15), who all express the view that the use of purposive sampling depends on the researcher’s judgement of whom to include in a sample. The literature reviewed varies when it comes to defining a particular sample size for use in purposive sampling. Tashakkori and Teddlie (2008:15) suggest a sample size of anything between 6-24 participants for case studies and 6-8 participants per group in focus groups. Onwuegbuzie and Collins (2007) suggest 3-5 participants for case studies, 12 participants for interviewing and a range of 6-12 participants (Chigada, 2014:120) for focus groups.

The two broad sampling strategies are illustrated in Figure 3.1 below. Probability sampling techniques are depicted on the left-hand side (simple random; stratified sampling; cluster sampling and systematic sampling) and non-probability sampling are depicted on the right-hand side of Figure 3.1 (convenience, judgemental, quota and purposive sampling techniques).

Figure 3.1 Sampling strategies



Source: Creswell (2009)

3.7 Data collection instrument

There are various data collection tools for qualitative research projects. The research methodology and research questions inform the type of data collection tools to use (Creswell, 2012:34). Open-ended questions were designed and used to collect relevant data from participants; therefore, an interview guide sufficed. The interview guide comprised three sections, namely: section A focused on biographical information, section B comprised questions relating to knowledge management and section C focused on RFID as an enabler of knowledge management. The Research Instrument is illustrated in Appendix A. The structure of the interview protocol used in this study comprised the following: a heading, instructions to the interviewer, the key research questions, probes to follow key questions, transition messages for the interviewer, space for recording the interviewer's comments and space for recording reflective notes (Creswell, 2010:178). Data collection techniques determine the success of an investigation. Powell (2008:49), in Grant (2008:175), suggests the use of questionnaires, interviews, observation and the analysis of documents for case study data collection.

The biographical data sought in this study focused on the title or position of the respondent, the gender, the section or department and years employed in the current position. This

information was paramount to mitigate bias. Bias could have arisen if respondents in similar management positions were selected or if males or females were selected. Respondents from one department could also have been selected. Section B of the interview guide comprised questions that focused on knowledge management. This section was important because, if the respondents did not understand the concept of knowledge management, it would have been difficult to proceed, as most of the terminologies and questions focused on KM. The third section of the interview guide comprised questions focusing on RFID technologies. A total of seven questions were asked to extrapolate data and experiences from respondents. A total of 20 pre-designed, semi-structured questions formed the interview protocol for this study. Understandably, the open-ended questions were simple, because a pilot study had been conducted to determine the plausibility and trustworthiness of the research instrument.

3.7.1 Interviews

The interview is essentially a qualitative data gathering technique that finds the interviewer directing the interaction and inquiry in a very structured or unstructured manner, depending on the purpose of the interview (Denzin & Lincoln, 1994:365). Interviews are an important part of any research project as they provide the opportunity for the researcher to investigate further, to solve problems and to gather data that will not be obtained in other ways (Cunningham 1993:314). Interviews allow researchers to collect data that cannot be directly observed and they also allow probing and verification, thus increasing the accuracy of responses. The advantages of using an interview guide as suggested by Nguyen, Smyth and Gable (2004:21) include study reliability, while the freedom to pursue unexpected themes capitalises on the strengths of the case study research strategy. The researcher made appointments before the interviews to enable the interviewees to prepare adequately for the interviews. Interviews were conducted with each research participant; therefore, it was easier to ask probing questions to obtain clarity. Each interview session lasted 40 minutes, which was adequate for each participant to answer all 20 questions in full. In other words, section A was relatively simple because the researcher asked respondents to indicate options that applied to their situations. The other two sections required approximately 35 minutes to complete, therefore, the 40 minutes allocated for each interview session was adequate. Interviews created dialogues, sharing of experiences and information. The interactions that took place during the interviews helped to generate new knowledge, while building theory on the implementation. During the face-to-face interviews, respondents provided answers in their own words without restriction. Research participants were notified in advance of the purpose, date, venue and duration of each

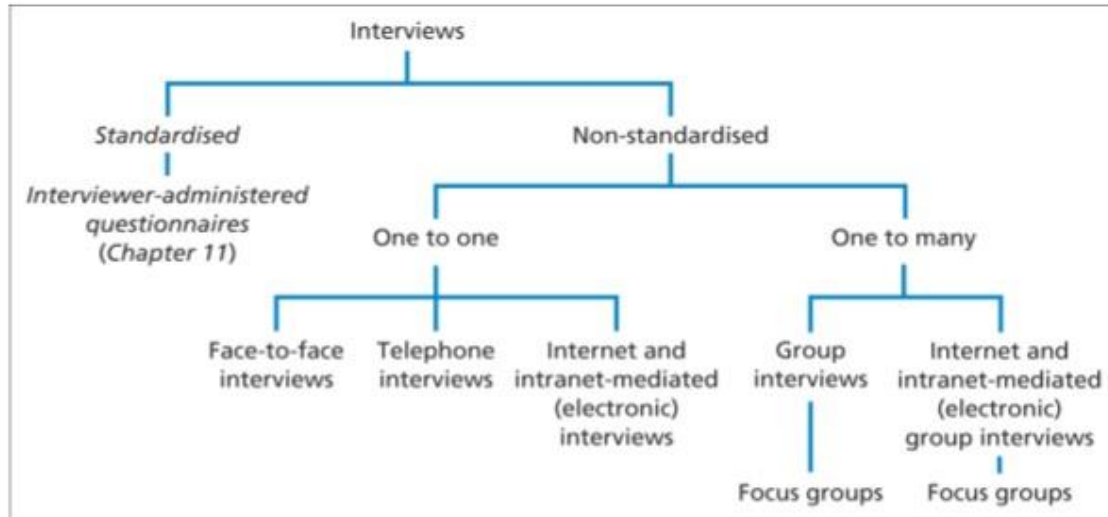
interview. Informing interviewees helped to calm down and relax them. Qualitative data were also collected from the Unisa library's annual reports.

3.7.1.1 Semi-structured interviews

The interview is essentially a qualitative data gathering technique that finds the interviewer directing the interaction and inquiry in a very structured or unstructured manner, depending on the purpose of the interview (Chigada, 2014:109). Each of these interview structures fits specific environments. As illustrated in Figure 3.2 below, interviews can be standardised or non-standardised (Matthews & Ross, 2010). Within the continuum of standardised interviews, researchers use interviewer-administered questionnaires, whereas with non-standardised forms, researchers work one-to-one or one-to-many. A set of common topics were followed where research questions were introduced to respondents. The most important approach was to explain to each participant the purpose of the interview and to assure each participant that information provided during the interviews would remain private and confidential. A number of issues were considered when designing the semi-structured interview and these pertained to the advantages and disadvantages posed by the semi-structure. All interviews were recorded with the aid of a voice recorder.

Research purpose and strategy (1)

Forms of interview



Saunders *et al.* (2009)

Figure 3.2 Forms of interviews

3.7.1.2 Advantages and disadvantages of semi-structured interviews

The advantages of using semi-structured interviews were:

- respondents answered research questions in their own words without restrictions
- probing questions were asked
- there were interactions during the interviews
- all sensitive questions were identified and removed before conducting the final interviews.

The disadvantages of semi-structured interviews were:

- novice qualitative researchers can conduct inductive research
- there was a possibility of bias.

An enabling environment was created to ensure that respondents were comfortable and not exposed to any emotional harm. Matthews and Ross (2010:219) state that interviews provide the opportunity for direct interaction between the researcher and the participants. The semi-

structured interviews enabled the interviewer to be sensitive to the needs of the participant in talking about potentially distressing subjects. Some challenges that were noted during the interviews were that some participants felt intimidated because they seemed uneasy. If the researcher fails to establish rapport with the respondents before and after the interviews, it could cause the respondents to provide data that is not relevant to the study, because an element of fear may have been cultivated. In order to carry out the interviews successfully, an enabling interview environment was created to put the interviewees at ease. Interviews were carried out in the Unisa library boardroom where there is a minimum of disturbance and interruption. The purpose of the interviews was explained to the participants as part of ethical considerations.

3.8 Pilot study/Pretesting

Chigada (2014) defines a pilot study as a small-scale study undertaken prior to conducting the actual study. The pilot study was conducted to assess the feasibility, time, costs and challenges of conducting the current study (Malhotra, 2010). Pilot studies act as quality assurance processes where researchers try to ascertain whether the research instrument is plausible and credible (Creswell, 2012:34). In qualitative research projects, pilot studies are conducted with at least two randomly selected participants. The intention was to get balanced views and feedback on the research instrument. Including many participants at that stage may be costly and time-consuming, therefore, two participants were selected for the pilot study. The participants were asked to rate the plausibility, trustworthiness and credibility of the research instrument. Responses from the pilot study were used to fine-tune or integrate their recommendations into the current research instrument so that a trustworthy instrument was designed for the final study. Respondents indicated that more questions focusing on the application of RFID should be included. Two additional questions were designed and integrated into the research instrument (see Appendix A).

Respondents also suggested that there were grammatical errors that required attention after which the research instrument was sent for editing and formatting. In addition, the pilot study revealed that some biographical questions were in the wrong place and should be moved to section A. This recommendation was accepted and implemented. Question 12, which sought to establish the years of experience, was moved from section B to section A and it was fused with question 8 to reflect the current demographic construct in the new research instrument. Other issues checked during the pilot study include clarity of research questions, ambiguity or clarity of statements and that all the key concepts had been addressed in the interview guide.

All findings and recommendations from the pilot study were used to gain more insight into the subject under investigation, thus, a user-friendly research instrument was designed (Ngulube, 2010:48). The two pilot study participants were thanked for their participation and were informed that they would not take part in the final study to mitigate duplication of findings.

3.9 Data Quality

Another important aspect of any research project is the quality of data or findings. The research instrument should measure what it was designed to measure even if it was used in a different setting, but under the same conditions (Yin, 2009:43). The reliability of a research instrument is shown when the research procedure consistently gives the same results repeatedly. The reliability of the interview protocol was pretested during the pilot study. Key data quality issues considered in this study will be discussed in the following sections.

3.9.1 Credibility

Chigada (2014:121) defines credibility as the quality of being trusted and believed in. It was important to ensure that the research instrument was credible. Credibility was achieved by engaging independent analysts to verify the research findings. In addition, other data sources were consulted to enhance the credibility of the research findings. The Unisa library's annual reports and the World Wide Web were used to gain deeper insight into the activities of RFID and knowledge management at the Unisa library. Research findings were discussed with research participants to ensure all data were recorded accurately before the results were published. Prior to conducting the actual research, a pilot study was conducted to ascertain the plausibility and feasibility of the research instrument. Findings and recommendations from the pilot study were incorporated to fine-tune the research instrument.

3.9.2 Transferability

A simple definition of transferability is to move from one place to another or from one person to another (Romm, Ngulube & Mathipa, 2014). There were rich sets of data accounts that emerged during this study; therefore, it was possible that people could interpret the meanings of findings in different ways. Users and other people can make judgements about the possible transferability of findings from the sample case to other cases (Saunders et al., 2012:382). Transferability is the extent to which inferences can be made or generalised about causal relationships (Yin, 2009:47). In other words, it is the interaction of causal relationships. Its

importance is due to the fact that, if redone, the same study should produce the same results or, if another individual uses the same method, even in a different company, industry or organisation, they should be able to replicate the results. Analytically generalising the results needs to be possible (Chigada, 2014:116). An appropriate research design results in viable external validity of a study.

3.9.3 Dependability

Creswell (2014:2) defines dependability as the quality of being relied upon. All complete records of processes and phases were documented, including data analysis decisions for review by peers and others (Saunders et al., 2012:382). All processes were documented for future reference. Participants were consulted for their input to ensure that all statements were complete. Documents generated from the beginning of this study such as ethical clearances, permission to conduct the study, research instrument, respondents' feedback, computer records and other paper trails were kept to ensure that the study was conducted with natural persons/objects and relevant data were collected in the process.

3.9.4 Confirmability

Confirmability refers to being theoretically or actually supported by reference to empirical facts (Ngulube, 2014:14). There was a need to check and re-check data in this study. Research participants were consulted to confirm that research findings were accurate. Independent analysts were consulted to verify and validate results derived from using qualitative data analysis software.

3.10 Data analysis

Qualitative Data Analysis (QDA) is the range of processes and procedures where all raw data were processed into some meaningful form (Creswell, 2017). The objective of analysing data is to ensure that the data provide explanations for, and an understanding or interpretation of, the phenomenon under investigation. Leedy and Omrod (2010:47) suggest the following steps for data analysis:

- The logical arrangement of the details of the case being studied
- Categorisation of data
- The examination of bits of data for their relevance towards the case

- Analysing the data for underlying themes and patterns
- The synthesis of results and generalisations arising thereafter

Mouton (2005:108) indicates that analysis involves breaking up data into manageable themes, patterns, trends and relationships. All data were cleaned up to reduce redundancies and errors. All irrelevant data were kept apart from the data that were relevant to the study. All transcriptions were exported to Nvivo 10, a qualitative data analysis program. With Nvivo 10, emerging codes were grouped into themes, allowing thematic data analysis to be performed.

Braun and Clarke (2006:77) state that thematic data analysis is widely used in qualitative research. It was possible for the researcher to identify, examine and record emerging themes and how each of the themes addressed the research questions. The emerging themes were analysed in detail in relation to research questions. Therefore, using thematic data analysis, the phenomenon under investigation was described, which, in this instance, were the events occurring at the Unisa library. These events included KM systems, KM philosophy and the use of RFID as an enabler of KM. The illustration in Figure 3.3 below presents three scenarios for analysing qualitative data, namely co-concurrence analysis which entails word associations, sequence analysis, co-word analysis and comparison between word parts; comparative analysis which compels the researcher to use contingency tables, cluster analysis, multiple correspondence analysis and specificity analysis; and thematic analysis which was described earlier.

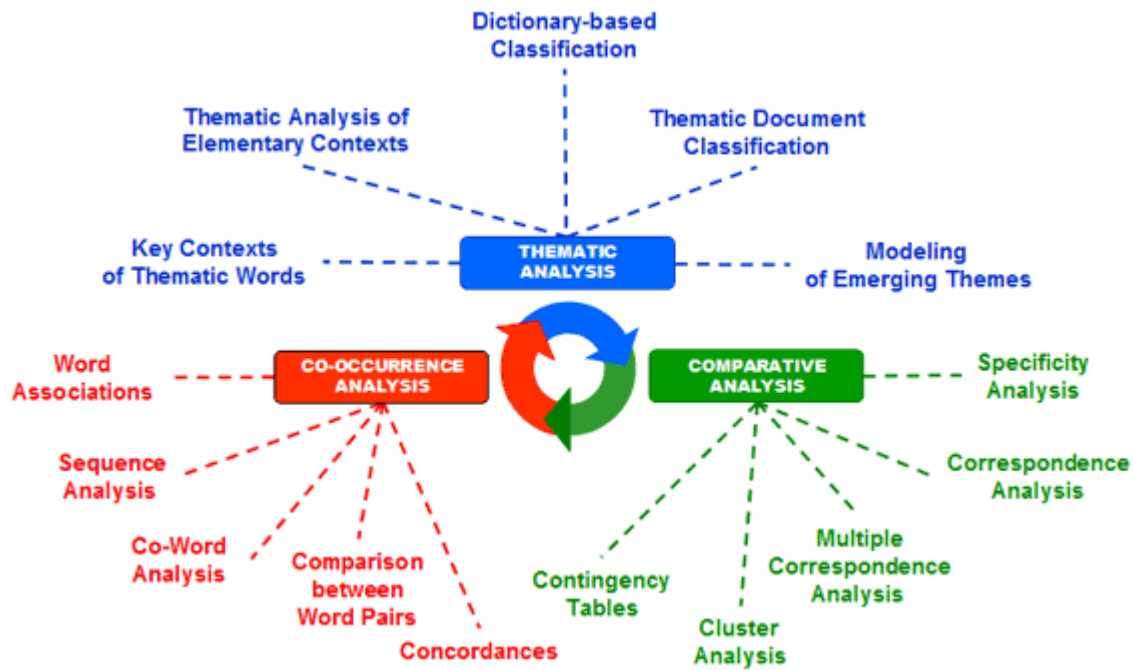


Figure 3.3 Qualitative data analysis

Source: Magagula (2017)

3.11 Limitations of the study

When this study was conducted, some limitations were identified and these were as follows: the study focused on the Unisa library's systems while ignoring other functional areas that could have benefited from RFID to improve services. All the Unisa faculties and departments are involved in supply chain management in one way or another, and therefore discussing the RFID concept at university level would have helped to resolve an organisation-wide challenge at minimum cost, at once and involving all the stakeholders. If this study had focused on all service functions, an appropriate solution for Unisa and other South African universities would have been identified and prescribed. Another limitation of the study was the sample size of the study. Only 12 respondents were selected; therefore, it was difficult to generalise the findings to the whole population. The sample size was informed by the research methodology that was used in this study. If a different research methodology had been used, a large sample size would have been selected, resulting in the generation of different findings. The inclusion of a larger sample size alters the findings and the methodology that would be used. Although the research methodology used in this study may be a contributory limitation, it should be noted that the research topic and research questions guided the research paradigm for the study. The other

limitation of the study was the exclusion of other potential participants who might have possessed additional data needed for the study.

3.12 Elimination of bias

Creswell (2014:21) states that there is a high probability of bias in qualitative research projects attributable to the data collection tools used. The researcher is immersed with the subjects under investigation, which means the rate of bias is likely to rise. In addition, the researcher's judgement as to whom to include or exclude from the study might create bias because the researcher's friends or relatives may be chosen above people who may possess data that are relevant for the study. To mitigate bias arising from immersion with subjects, the researcher avoided discussing personal or sensitive issues prior to and after the interviews. The focus was on collecting as much data as was possible to ensure the problem at hand was resolved within the stipulated time frames. Secondly, the researcher avoided selecting friends or relatives for the study because the objective was to develop a solution that was long overdue for the Unisa Library. By so doing, the researcher did not want to comprise the research standing and credibility by reporting false findings. In this study, data were collected from research participants through face-to-face interviews. There was a high possibility of research bias if research questions were asked in other non-business languages. The English language was the medium of communication to ensure respondents provided answers aligned to what was being asked. If different languages had been used in this study, different answers would have been provided as respondents would have interpreted the questions differently. When adequate answers were provided, the researcher politely asked the respondents to move to the next question. This approach helped to mitigate scope creep, that is, discussion of irrelevant issues, which would have created dialogues or arguments.

3.13 Ethical considerations

The ethical issues that will be considered in this study will be discussed in the following sections:

3.13.1 Ensuring informed consent of participants

A right granted by a research participant is referred to as informed consent (Ngulube, 2010:124). Before collecting data from the participants, the researcher held brief meetings with

the participants to inform them of the purpose of the study. During that process, participants were requested to indicate their willingness to participate in the study.

3.13.2 Ensuring no harm to participants

Harm to participants may be physical or emotional. The interviews were conducted at the Unisa library to minimise time lost to interruptions. The interview venue was well ventilated and enabling. All leading and sensitive questions were removed to mitigate emotional harm (Cozby & Bates, 2012:23). During the interviews, the researcher also ensured that the interview room was clean and safe to use. In that context, the researcher identified and used the boardroom during interviews. The researcher ensured that no coercion of any kind was applied to the participants, firstly, to take part in the study or, secondly, to divulge information they should not, or preferred not to, share.

3.13.3 Personal information

All personal information was kept private and confidential. Respondents' information was shared with third parties, but used solely for the purpose of the study. Participants had a right to refuse to participate in the research and could, at any stage of the research, change/ withdraw the informed consent given earlier, without having to give any reasons.

3.13.4 Ensuring that permission is obtained

It was important that official channels were cleared by formally by requesting permission to perform a study. Permission to conduct this study has been granted by the Unisa Department of Information Science, the Research Ethics Committee and library management.

3.14 Chapter Summary

The focus of this third chapter was to provide a detailed discussion of the research plan used to collect, analyse and interpret data for this study. It was revealed in this study that a qualitative research approach was adopted because a subjective epistemological stance informed this study. The interpretivist ontological view was adopted, thus it became apparent that an appropriate qualitative research approach was used. Key issues that augment the research plan were discussed, showing how the study was conducted. Data were collected from research participants through face-to-face interviews, guided by a set of pre-designed open-ended questions. The semi-structured interview protocol was the best interview design, because research participants answered questions in their own words without restrictions. All emerging

themes were analysed through thematic data analysis run through the Nvivo 10 qualitative computer program. Findings were contextualised to the Unisa library. The findings of this study will be presented, analysed and interpreted in chapter four.

CHAPTER FOUR: RESULTS, DISCUSSION AND INTERPRETATION OF FINDINGS

4.1 Introduction

In the preceding chapter, an outline of the research plan was presented. Various concepts were discussed showing how the researcher conducted this study up to the stage of analysing and presenting findings discussed in the current chapter. This phenomenological study was carried out at the Unisa main campus library, Muckleneuk, in Pretoria with a sample of 12 selected participants by conducting face-to-face interviews. The need to understand how RFID technologies could be utilised as knowledge management enablers in academic libraries premised this study. Therefore, appropriate questions were posed to respondents during the interviews, culminating in the development of research objectives and research questions that guided this study. A set of 15 open-ended questions was developed and data from the participants were summarised into themes and discussed in relation to the research objectives as indicated below:

- To determine the knowledge management practices at the Unisa library
- To determine how RFID technologies enhance knowledge management at the Unisa library
- To determine factors impeding the utilisation of RFID technologies in knowledge management at the Unisa library
- To make recommendations on how the utilisation of RFID technologies can improve knowledge management in the Unisa library

The first part of the interviews focused on establishing the demographic characteristics of respondents, including their gender, age, designations, years in service, qualifications and names (optional). The 12 participants selected for this study were drawn from different departments: information systems, information resources purchasing, cataloguing, academics and administration staff. These individuals possessed varying levels of experiences which was paramount for the study because the data were relevant to address the questions posed in this study. Therefore, it was prudent to use the non-probability purposive and convenience sampling techniques because sample members were readily available and accessible, and they

possessed data required to address the problem at hand. A summary of demographic profiles is as follows:

- Four white respondents, comprising two female and two male respondents.
- Eight black respondents, comprising four female and four male respondents.
- Of the four white respondents, two had doctorate degrees, one had an honours degree and the last one had a bachelor's degree.
- Three of the white respondents were between 50-59 years old, while the other respondent was between 40-49 years.
- All four the black male respondents were between 40-49 years old. Two of the respondents had honours degrees, while one had a certificate and the other had a master's degree.
- Of the four black female respondents, two had honours degrees, one had a master's degree, while the other had a diploma. Two black female respondents were between 40-49 years old and the other two were between 50-59 years old.

4.2 Results

An inductive thematic data analysis was performed in this study resulting in various themes of emerging during the data collection process. In any research project, it is necessary to adopt and use the appropriate data analysis tool and approach in order to produce plausible results. Thematic data analysis (TDA) was performed by using Nvivo 10, a qualitative data analysis program. Interview transcriptions were captured on the Nvivo 10 program and computed, resulting in the identification of emerging themes. It became easier to analyse themes in line with the research questions and objectives.

Using the thematic analysis process, key concepts emerged during the face-to-face interviews where respondents engaged in discussions, shared their experiences in working for the Unisa and in various departments of the university. Respondents shared pertinent issues regarding the management, running or challenges confronted in an academic library. These themes were viewed as essential in determining the understanding of all the participants. These categories had been labelled as:

- Understanding of the concept of knowledge management
- Key issues about knowledge management

- Level of involvement in knowledge management
- Knowledge management practices in the workplace
- Knowledge management challenges at the academic library
- Impact of digitisation towards record keeping
- Capabilities of RFID technologies in academic libraries
- Skills matrix for utilising RFID technologies
- Challenges of using RFID technologies

It was reported that the main data collection instrument was the interview guide which helped the researcher to conduct face-to-face interviews. The records of the Unisa academic library and internet sources were used to collect additional data for this study. In this section, data collected during the interviews will be analysed first, followed by content analysis. Respondents engaged in discussions shared their experiences in working for Unisa, the use of RFID technologies and challenges they were confronted with. A total of 15 open-ended questions were asked during the data collection process. With reference to keeping the anonymity and confidentiality of respondents' identities, each respondent was allocated a code as shown in Table 4.2 below. The responses presented below will cite the respondents' codes. Creswell (2012) states that it is imperative to keep the respondents' information private and confidential, unless the respondents have given written or expressed approval that their information can be shared with third parties. Ngulube (2014) states that in qualitative research, researchers can hide the identities of respondents by allocating a code to each respondent.

Table 4.1 Respondents' codes

Code	Respondent
MA001	Respondent 1
MA002	Respondent 2
MA003	Respondent 3
MA004	Respondent 4
MA005	Respondent 5
MA006	Respondent 6
MA007	Respondent 7
MA008	Respondent 8
MA009	Respondent 9
MA010	Respondent 10
MA011	Respondent 11
MA012	Respondent 12

4.3 Data analysis, interpretation and discussion

Analysis of data will be performed on the following themes that were highlighted above and these were the following:

4.3.1 Understanding of the concept knowledge management

The first theme of this study was to establish the respondents' understanding of the concept knowledge management. In order to explore their understanding, the following question was asked: "What do you understand by 'knowledge management?'" The responses below indicate a good understanding of 'knowledge sharing' but not 'knowledge-sharing practices':

"It is the way human capital is shared and refers to how we communicate what we know and how we know it." [Participant MA001]

"It is the exchange of information through knowledge systems and various mediums that we have, via conversations with one another, through e-mails, phone calls and current information systems that we have already. For me, it is the exchange of information." [Participant MA004]

“... [K]nowledge management depends on tapping the tacit and often highly subjective insights, intuitions and hunches of individual employees.” [Participant MA006]

“... [K]nowledge management can mean information embedded in documents or repositories, routines or processes and norms.” [Participant MA009]

“... [K]nowledge management can encompass a wide range of things, so it is not just things that are written or spoken between people one-to-one, it can also be between lots of people in the team ... for example, it could be formal or informal ...” [Participant MA011].

Respondents' understanding of KM was adequate because there was evidence that KM is designed to enhance efficiency in organisations. Wang et al. (2001) explains that in today's economy, organisations are using organisational knowledge to leverage organisational assets and create value from it. In the knowledge economy, knowledge has become the basic form of capital. In organisations it often becomes embedded not only in documents or repositories, but also in organisational routines, processes, practices and norms. Rather, knowledge depends on tapping the tacit and often highly subjective insights, intuitions and hunches of individual employees and making those insights available for testing and use by the company as a whole (Wiig, 1998; Chigada, 2014).

4.3.2 Key issues about knowledge management

The second theme of the study focused on key issues about knowledge management. Respondents were asked, “What are the key issues associated with knowledge management?” The following responses indicate key issues that are synonymous with knowledge management:

“There are different types of knowledge which should be known and these types of knowledge are dependent on each other.” [Participant MA001]

“... [K]nowledge management depends on tapping the tacit and often highly subjective insights, intuitions and hunches of individual employees. However, management fails to recognise and acknowledge individual employees' knowledge.” [Participant MA003]

“... [K]nowledge management is a relatively new concept which is often misconstrued to mean information technology. KM is superior or encompasses information science, information technology, business management and it is these issues that impede the phenomenal growth of the profession.” [Participant MA006]

“... [K]nowledge management is not the same as data, information or wisdom. Data has to be processed to produce information and information is conveyed into knowledge...” [Participant MA008]

“... [K]nowledge management is a key organisational strategic asset. Firms are harnessing KM to leverage their competitiveness...” [Participant MA012]

With reference to the views presented by the respondents, Mostert and Snyman (2003) state that successful organisations are knowledge-creating organisations that produce, disseminate and embody new knowledge in new products and services, and find ways to better deliver those products and services for the growth of the organisation. The views of Mostert and Snyman (2003) signify that there are various tools, technologies and systems closely linked to KM. Chigada (2014) also states that KM is often conflated to be information technology. However, there is evidence that firms such as banks are moving towards a knowledge management-based approach to leverage competitiveness (Chigada & Ngulube, 2015). Wang et al. (2001) explain that in today’s knowledge economies, organisations are using organisational knowledge to leverage organisational assets and create value from it. In the knowledge economy, knowledge has become the basic form of capital. Economic growth is driven by the accumulation of knowledge. Knowledge is used in organisations to make money.

Through the implementation of KM practices and technologies, academic libraries are poised to deliver the best possible services, function effectively and operate in environments characterised by transparency and accountability. In support of Gaffoor and Cloete (2010), Fowler and Pryke (2003) point out that “one of the implications is that organisations should be strategically aligned with their clients and stakeholders to provide better services and understanding their clients’ needs”. Public institutions and private organisations should constantly communicate with their customers to determine and ensure that their needs and

wants are fully addressed, culminating in the development and provision of solutions. This gives both parties an opportunity to share knowledge, which is then translated into information stored in documents, thus eventually becoming organisational knowledge. For LIS managers to be able to preserve organisational knowledge, knowledge creation, knowledge sharing and knowledge-retention strategies, supported by KM enablers, should be available in an organisation.

4.3.3 Level of involvement in knowledge management

The next theme sought to establish respondents' level of involvement in knowledge management initiatives. In order to establish these varying levels of their involvement, this question was posed, "What is your level of involvement in KM initiatives?" Six respondents' viewpoints were captured verbatim as shown below:

"I am involved in KM on a daily basis through procurement of information resources. There are processes and procedures that should be followed and adhered to. KM resides in such processes" [Participant MA002]

"My inherent knowledge in processes and routines is an indication of my involvement in knowledge management. The experience built over time is a major milestone in my career in KM....." [Participant MA003]

"... [K]nowledge management depends on tapping the tacit of individual employees. I work in a team of competent colleagues whose invaluable knowledge has been incredible in how we manage our processes over the years." [Participant MA005]

"... I share knowledge with my colleagues, students and academics. Scholarly knowledge output from universities and research institutes forms part of the institutional repositories with the role of preservation and dissemination of scholarly outputs." [Participant MA007]

"... [K]nowledge management can encompass a wide range of things, so it is not just things that are written or spoken between people one-to-one, it can also be between lots

of people in the team ... for example, it could be formal or informal” [Participant MA010].

“...I engage in meetings, teleconferences and electronic discussions and other social interactions....” [Participant MA012].

From the above extracts, it was clear that respondents were involved in KM at different levels. Literature states that tacit knowledge can be achieved through face-to-face meetings, teleconferencing and electronic discussions, while Nonaka and Takeuchi (1995) think that tacit knowledge can be transmitted through social interactions between individuals – that is, through the socialisation component of the SECI model. Through dialogues, discussions, experience sharing and observation, tacit knowledge is amplified at group or organisational level. Tacit knowledge represents knowledge based on individuals’ competencies, experiences and skills of employees (Jacobs & Roodt, 2007). Organisations need both tacit and explicit knowledge as competitive advantages, but the creation, sharing, capturing and retention of knowledge is greatly influenced by the prevailing knowledge management practices in the organisation.

4.3.4 Knowledge management practices in the workplace

In this theme respondents were asked to state the knowledge management practices in their workstations. The question was, “What knowledge management practices are there in your work stations?” Varying responses were provided to the satisfaction of the interviewer.

“We have knowledge sharing practices in our department. We hold regular meetings.” [Participant MA004]

“Knowledge is acquired through information sharing in meetings, interactions with information users ...” [Participant MA006]

“... [K]nowledge management practices vary from one department to the other. In our department we retain knowledge through best practices, processes, databases and cataloguing.” [Participant MA009]

“... I share knowledge with my colleagues, students and academics. Scholarly knowledge output from universities and research institutes forms part of the institutional repositories with the role of preservation and dissemination of scholarly outputs.” [Participant MA007]

“... [K]nowledge creation and acquisition is accomplished through sharing with researchers and information users. Employees also share information, through processes and routines” [Participant MA011].

“...I consult other experienced and knowledgeable colleagues....” [Participant MA003].

Andreeva and Kianto (2012:618) explain that “KM practices refer to the aspects of the organisation that are manipulable and controllable by conscious and intentional management activities”. Knowledge processes naturally exist in organisations, irrespective of any management efforts. Knowledge processes involve knowledge creation, sharing, acquisition, transfer and application. In the university setting, this is practically part of the core business of a university. After making clear sense of knowledge sharing, the researchers and scholars are required to develop the sense of creation. Numerous popular researchers have explained that the process of knowledge creation is based on different ways of knowledge sharing among employees. Nonaka (2000:96) defines knowledge creation as the process of making tacit knowledge explicit. To convert tacit knowledge into explicit knowledge means finding a way to express the inexpressible. Wai and Jayasingam (2012) explained in their study that a knowledge sharing culture was found to positively influence knowledge creation. According to Michell and Boyle (2010), knowledge creation means the generation, development, implementation and exploitation of new ideas.

4.3.5 Knowledge management challenges at the academic library

When implementing knowledge management initiatives, challenges can arise that impede the processes. Respondents were asked to state the challenges they had come across in the Unisa academic library. The following viewpoints were raised:

“Most people do not understand and know the concept of knowledge management, therefore talking about the subject requires patience...” [Participant MA001]

“There is no formal KM strategy in the library, thus, each department does things the way they deem fit, resulting in little or no synergies between departments ...” [Participant MA003]

“... there is a high rate of staff exodus from the Unisa academic which impedes succession planning or imparting knowledge to a new generation of employees ...” [Participant MA004]

“... Some colleagues are not willing to share information.” [Participant MA005]

“... Fear of exposing individuals’ intellectual property to colleagues’ results in less knowledge sharing” [Participant MA006].

“...There are no KM retention strategies in place....” [Participant MA007].

“...some degree of mistrust amongst colleagues ...” [Participant MA009].

“.... knowledge is lost because there are no mechanisms to detect its presence or loss in the academic library ...” [Participant MA0011].

The views raised in the above extracts are supported by literature that states that knowledge sharing in organisations is becoming important and organisations are making major investments to implement KM solutions within their environments. Knowledge sharing in academic libraries or other institutions dictates that management should adopt knowledge sharing technologies such as RFID technologies. Chigada and Ngulube (2014:62) state that knowledge sharing platforms help organisations integrate vast assortments of disparate applications, which enable information sharing while creating a centralised knowledge management approach across the organisation. Collaboration technologies support virtual meetings, subject expert repositories, image galleries, instant messaging, wireless web services, training and e-mail management (Hedgebeth, 2007:51). Furthermore, literature supports the views raised by respondents who indicated that knowledge can be lost easily if there are no mechanisms to detect its presence or loss. The knowledge and expertise of employees should be retained before they leave the organisation. In the absence of knowledge retention strategies, organisations lose tacit knowledge because of various kinds of attrition,

such as when employees leave for other organisations. Becerra and Fernandez (2004) state that organisational culture reflects beliefs and norms that guide the behaviour of the members of the organisation. The knowledge held by experienced and expert workers needs to be captured and retained for the continuity of the organisation/s and it is important for the organisation/s to develop strategies to prevent the loss of knowledge.

4.3.6 Impact of digitisation towards record keeping

During the interviews, respondents were asked to indicate their view regarding the impact of digitisation on record keeping at academic libraries. All 12 the participants had different viewpoints, but the following issues were noted:

“Records should be kept in digital format for longevity.” [Participant MA012]

“There is a significant impact because processes will drastically change.” [Participant MA010]

“... Preservation of records is required for future use. We cannot live without history ...” [Participant MA005]

“... I believe digitisation of records will improve processes and preservation of records.” [Participant MA004]

“A positive outcome will come of digitised records.” [Participant MA006].

“Paper records easily wear and tear, therefore digitisation helps preserve the life span of records. In addition, digital format of records can be stored in the cloud unlike paper records which require massive storage facilities.” [Participant MA008].

Digitising the library collection helped to ensure long-term stability of records and archival systems. McKinsey Global Institute Report (2016) showed that digitisation results in the integration of data and information which generated more economic value for the firm. With digitisation, the world was more connected than ever before, but the nature of its connection had changed in a fundamental way. Literature reports that digitised records can be free of errors

and repetitions, and easy storage of digitised information could also be easily transferred (Owen, 1997). From the respondents' viewpoints and suggestions in literature, it was evident that digitisation has a positive impact on record keeping.

According to Butters (2008: 198-199), within libraries, RFID may be used in a way that replaces traditional barcodes for the storage of item identification and other data. Staff and library users are able to interact with library materials in ways that enhance efficiency and reduce repetitive handling of materials. The library applications employ what are essentially smart labels with adhesive backing and memory capacities sufficient to store the item identifier, usually equivalent to the barcode number, together with other information required such as institutional identifier, media code or call number.

Yu (2007: 54) supports Buttons and shares that RFID applications that provide batch access and stage mass data and reprogramming are better than barcodes. Applying RFID can promote operational efficiency and precision. Although RFID has improved the efficiency of the library, the service has not changed (Yu, 2007:54). Ayre (2012: 1) states that library RFID systems are composed of tags, readers and middleware software. The RFID systems rely heavily on the integrated library system (ILS) and the middleware is designed to support communication between the reader and the ILS. RFID technology offers libraries many solutions that enhance efficiency in circulation and security, thereby freeing staff to provide increased information and intellectual support to patrons/ clients.

4.3.7 Capabilities of RFID technologies in academic libraries

Questions relating to the use of RFID technologies were posed in the second section of the interview guide. Respondents were asked questions to extrapolate the extent to which RFID technologies were used in the Unisa academic library. For example, respondents were asked, "To what extent are RFID technologies used in academic libraries?" These responses were adequate to gain an understanding of how the technologies were used:

"For tracking and tracing the movement of information resources such as books from suppliers." [Participant MA001].

"Stock management system that helps the library staff to manage inventory." [Participant MA002].

“RFID technologies are used in academic libraries for providing accurate and up-to-date information regarding purchased information resources.” [Participant MA003]

“We use these technologies for maintenance management. Offers opportunities to improve communication facilitate team work and improve information management skills.” [Participant MA004]

“... Used for storage purposes ...” [Participant MA005].

“... Track movable assets and materials accurately ...” [Participant MA006].

“...eliminates the frustration of having to physically locating movable assets ...” [Participant MA007].

“... Helps avoid unnecessary just in time purchases when assets go missing ...” [Participant MA008].

“... Collect real-time data on assets ...” [Participant MA009].

“... Identify and store information. Encourages greater cross-fertilisation between business processes ...” [Participant MA010].

“Reduce shrinkage.” [Participant MA011].

“... material handling efficiency. Encourages greater cross-fertilisation between business processes ...” [Participant MA012].

From the extracts above, there were more benefits to using RFID technologies. Literature supports all the viewpoints raised above. By placing RFID tags on the assets and readers at key entry and exit points and various other locations, movable assets will be automatically tracked and located in real time (Conneely, 2009). The widespread use of RFID could automate the tracking of pallets, cases, individual products, as well as reusable assets such as bins and

containers throughout the supply chain. With RFID, collection of real-time data on individual items could become a reality, which was not possible with the use of bar codes. A future vision of RFID includes the “Internet of Things,” which refers to a global network of computers and objects in which computers are able to identify and store information instantly on any object, anywhere in the world (Teresko, 2003).). RFID is believed to offer many benefits in supply chain management, including shrinkage reduction, material handling efficiency, increased product availability and improved asset management (Angeles, 2005; Li & Visich, 2006; Taghaboni-Dutta & Velthouse, 2006).

4.3.8 Skills matrix for utilising RFID technologies

It was established that RFID technologies require specialist skills for the academic library to achieve value for money. Literature reports that some employees shun new systems and technologies for fear of losing their jobs. In this instance, respondents were asked to identify the skills required when using RFID technologies.

“Basic computing skills suffice.” [Participant MA003]

“Analytical skills to extrapolate inventory management data and present in statistical format.” [Participant MA006]

“... very competent individuals with computing and analytical skills.” [Participant MA007]

“... very knowledgeable in RFID technologies.” [Participant MA008]

“... [K]nowledge management and RFID technical skills are required.” [Participant MA010].

“... computing skills ...” [Participant MA012].

Respondents made it clear that effective utilisation of RFID technologies requires analytical, computing and technical skills. Key issues that emerged from this question were that there was a new generation of information users that advocates for technology and it was highly likely

that the internet was now the preferred information resource centre. Additionally, digitisation was a new way of collecting and analysing data while providing platforms for engaging customers in the innovation process (Woetzel et al. 2016). Therefore, it was evident that staff need training and development to acquire appropriate skills in order to serve a new generation of information users. The library should be recognised as the institutional repository of all Unisa stakeholders where they house the content and which acts as a storehouse (ILO, 2016).

4.3.9 Challenges of using RFID technologies

Various challenges can arise when new technologies and systems are implemented. Respondents were asked to mention the challenges they faced when using RFID technologies and the following were their responses:

“If the employees are not properly consulted when new technologies are introduced, there is a high probability of resistance to change.” [Participant MA002]

“Lack of understanding and skills of the RFID technologies contributed significantly.” [Participant MA003]

“... Mistrust of the system and fear of the unknown.” [Participant MA005]

“... Employees reluctant to share their knowledge about RFID and other systems.” [Participant MA007]

“... Fear of the unknown, poor communication, lack of skills ...” [Participant MA010].

“... Lack of a consultative process between management and employees.” [Participant MA012].

With reference to the opinions provided above, there was an agreement that budgets, professional skills and education, technology and currency posed serious challenges in the field of digitisation and there was a need for more in-depth education. Cost-sharing initiatives and cooperation were suggested universally (Routhier, 2014).

All the respondents provided different types of challenges that they were confronted with during the use of RFID, which was in line with the suggestions presented in literature. In the PWC report (2012), it had been noted that a lack of ICT skills impacts negatively on digitisation, mainly in the socio-economic area where there had been a growth rate in the economy like GDP growth, job creation and innovation, and in the societal well-being of a country like quality of life and access to basic health services.

The fast-growing information and communication technologies impact on the field of information professionals, requiring them to have broader skills of not only the library and ICT, but also other competencies like flexibility, adaptability, reflective thinking, values and personal traits to manage the new evolving digital library environment (Raju, 2014). Respondents agreed with the view by Raju (2014) that users of the system at the academic libraries were still required to undergo extra training and obtain new skills to be able to use the new system. The economic value of the new system could only be realised if the system was used optimally.

Despite the RFID systems being in place, the underutilisation of the systems poses major challenges for the Unisa library. Library staff are unable to generate timeous and accurate reports. The underutilisation of ICTs and RFID technologies has compelled library staff to revert to manual systems that impede the monitoring and controlling, movement, and tracking and tracing of information resources in the institution's various academic libraries. Non-utilisation of RFID technologies is exposing the Unisa academic libraries to the loss of knowledge and information resources through pilferage and unaccounted for inventories. In addition, the non-utilisation of the features of these technologies has contributed to the inadequate reporting on the usage of information resources, reporting for audit purposes, and, in turn, inadequate information for decision-making and knowledge sharing. The challenges facing the Unisa academic libraries are supported by Ghazali et al. (2012) who state that RFID systems have the potential to improve real-time document and material tracking and control.

4.4 Content Analysis

The Unisa annual reports for 2015-2016 were used to ascertain the motivation, challenges and successes on the RFID projects. The challenges fell into a number of areas, the first of which is copyright due to lengthy legal issues. Documents like reports, statistics and conference

papers, international labour standard policy and law reports that related child labour were identified.

It was reported that the objective of RFID use in academic libraries was to enhance efficiency and organisational performance; therefore, there was a need to migrate from the traditional library system to a digital system to help preserve the intellectual contents of the digital objects and retain the ability of users to keep on using online information through constant technological change (Unisa, 2015). Migration ensures that content of the file is frequently moved from one file to another and from one format to another. It also updates the information so that it is consistent with the recent technology change.

In line with the nature of how libraries operate, there is a dire need to improve the monitoring, securing, tracking and tracing of library information resources to support meaningful decision-making. In the knowledge economy, it has become important for managers to see the benefits of focusing on knowledge assets over traditional assets in order to enhance and sustain organisational competitive advantage. The sustainability of a competitive academic library flows from the creation, ownership, protection and storage of difficult-to-imitate knowledge assets. The only way to achieve competitive advantage is by embracing knowledge management and there are various enablers that enhance the adoption of knowledge management, namely, ICTs, organisational culture, leadership and strategy.

The appropriate deployment of technology is likely to improve knowledge management practices in academic libraries as well as service quality and efficient operations. One approach that is gaining popularity is the adoption of RFID which has made significant economic impacts in many industries, especially in academic libraries, where the uptake of technology has been at a slower pace (Uniform Code Council, 2006). While RFID is a relatively old technology, more recent advancements in chip manufacturing technology are making RFID practical for new applications and settings, particularly consumer item level tagging. These advancements have the potential to revolutionise supply chain management, inventory control and logistics, thus providing up-to-date, accurate information and knowledge for decision-making. Organisations that harness knowledge assets and information resources tend to have a competitive advantage (Ching & Tai, 2009).

It was established that there was a slow uptake of technologies in academic libraries, which impeded access to real-time information and knowledge that are paramount in academia or research, thus, users of information may feel short-changed by a lack of access to fundamental knowledge (Want, 2004). The underutilisation of RFID technologies impedes the provision of relevant, accurate and timeous information to assist LIS managers to establish knowledge management practices and processes that create an enabling knowledge management environment. The global advancement of technology is compelling proponents of RFID to increasingly converge with other technologies such as sensors, GPS and GSM to provide accurate real-time location and environmental information ((Venture Development Forum (VDF), 2005).

The RFID allows data to be stored wirelessly and retrieved automatically. It also provides a significant improvement on barcode technology in identifying, tracking and stocking objects. RFID innovations have already been used in industries like logistics (Ngai et al. 2007a, b). Cavalleri et al. (2004) presented a prototype of a wearable RFID device for automated staff and patient identification and tracking. They also indicated that the RFID transponders, such as 13.56 Mhz and 125 KHz, were low costs and easy to use; however, most were not feasible for in-hospital patient identification as the reader station unit produced significant amounts of electromagnetic energy not compliant with European standards for healthcare environments.

In their study, Ahsan et al. (2009:244) present a healthcare generic model of knowledge asset capturing through mobile technology. RFID is a wireless technology that utilises radio waves to automatically capture data for identifying and tracking objects and/ or people. RFID itself is not new but enhancements in technology have made RFID very important in a number of areas, such as resource optimisation, increasing efficiency within organisational processes, providing enhanced customer care, making better overall organisational operations and improving healthcare (Ahsan et al., 2010).

4.5 Discussion of findings

In this section, the findings were discussed in relation to the research objectives restated earlier in this chapter.

4.5.1 Objective 1: To determine the knowledge management practices at the Unisa library

Firstly, respondents were asked if they understood the concept of knowledge management. From the responses given, it was evident that the concept of KM was understood and practiced in the firm. If this question had not been answered well, the prospects of proceeding with the face-to-face interviews would have been slim. It would have been a futile exercise to continue with a subject that was not known. Respondents indicated that they engaged in meetings, face-to-face interactions, training and development as part of the knowledge management practices in the Unisa academic library. Other practices included sharing of information through knowledge systems and conversations (Participants MA001 and MA004). Other participants showed that various practices such as team-building and meetings were used. Wang et al. (2001) explain that in today's economy, organisations are using organisational knowledge to leverage organisational assets and create value from it. In the knowledge economy, knowledge has become the basic form of capital. In organisations it often becomes embedded not only in documents or repositories, but also in organisational routines, processes, practices and norms. This first research objective was achieved, as evidence from both literature and responses from interviews showed the existence of knowledge management practices at the academic library.

4.5.2 *Objective 2: To determine how RFID technologies enhance knowledge management at the Unisa library*

The second research objective sought to establish how RFID technologies enhanced knowledge management in academic libraries. Firstly, respondents were asked what their levels of involvement in knowledge management were. The general overview was that all respondents were involved in KM in one way or another as their responsibilities required them to generate and share information. Respondents agreed that manual record-keeping systems were being phased out with a strong focus on digitisation. In the digitisation process, the use and deployment of RFID was one of the key strategic initiatives at Unisa. Participants indicated that the introduction and use of RFID technologies help to preserve records (longevity of records). Staff and library users are able to interact with library materials in ways that enhance efficiency and reduce repetitive handling of materials. The library applications employ what are essentially smart labels with adhesive backing and memory capacities sufficient to store the item identifier, usually equivalent to the barcode number, together with other information required such as institutional identifier, media code or call number (Yu, 2007).

Ayre (2012:1) states that library RFID systems are composed of tags, readers and middleware software. The RFID systems rely heavily on the ILS and the middleware is designed to support communication between the reader and the ILS. RFID technology offers libraries many solutions that enhance efficiency in circulation and security, thereby freeing staff to provide increased information and intellectual support to patrons/ clients. The above discussion shows that RFID enhances KM in different ways, therefore the evidence from the study confirms this objective. The study also revealed that RFID technologies were capable of tracking and tracing the movement of information resources, management of inventory, providing accurate and up-to-date information, improved communication (Participants MA001, MA002 and MA003). The widespread use of RFID could automate the tracking of pallets, cases, individual products, as well as reusable assets such as bins and containers throughout the supply chain. With RFID, collection of real-time data on individual items could become a reality, which was not possible with the use of bar codes. A future vision of RFID includes the “Internet of Things,” which refers to a global network of computers and objects in which computers are able to identify and store information instantly on any object, anywhere in the world (Teresko, 2003).

4.5.3 Objective 3: To determine factors impeding the utilisation of RFID technologies in knowledge management at the Unisa library

In this third research objective, the study sought to establish factors or challenges impeding the utilisation of RFID technologies in academic libraries. Whenever new systems are put in place, employees can resist it for fear of the unknown, fear of losing jobs or being made redundant (Brown, 2011). One of the key issues raised in the study was the need for computing skills, analytical skills and technical skills. Additionally, digitisation was a new way of collecting and analysing data while providing platforms for engaging customers in the innovation process (Woetzel et al. 2016). Therefore, it was evident that staff need training and development to acquire appropriate skills in order to serve a new generation of information users. The library should be recognised as the institutional repository of all Unisa stakeholders where it houses the content and which acts as a storehouse (ILO, 2016). Key factors that arose from the interviews were resistance to new systems, computing, analytical, technical skills and recognition of the RFID technologies.

In an attempt to reduce anxiety and the level of resistance to change, management should be able to communicate and articulate the objectives of using such systems in academic libraries. In the PWC report (2012) it had been noted that the lack of ICT skills impacts negatively on

digitisation mainly in the socio-economic area where there had been a growth rate in the economy like GDP growth, job creation and innovation and in the societal well-being of a country like quality of life, access to basic health services. The fast-growing information and communication technologies impact on the field of information professionals requiring them to have broader skills of not only the library and ICT, but also on other competencies like flexibility, adaptability, reflective thinking, values and personal traits to manage the new evolving digital library environment (Raju, 2014). Respondents agreed with the views by Raju (2014) that users of the system at the academic libraries were still required to receive extra training and obtain extra skills to be able to use the new system. The economic value of the new system could only be realised if the system was utilised optimally.

4.5.4 Objective 4: To make recommendations on how the utilisation of RFID technologies can improve management in the Unisa library

In the review annual reports and other sources of information, it was revealed that different initiatives were put into perspective by top management to ensure that technologies were required to improve information and knowledge management in the firm. The sustainability of a competitive academic library flows from the creation, ownership, protection and storage of difficult-to-imitate knowledge assets. The only way to achieve competitive advantage is by embracing knowledge management and there are various enablers that enhance the adoption of knowledge management, namely ICTs, organisational culture, leadership and strategy.

4.6 Chapter summary

In conclusion, research findings were presented in three sections. Demographic variables of respondents showed that male and female (black and white) were selected for the study. The selection of diverse racial groups and both genders helped to mitigate bias associated with qualitative research approaches where non-probability sampling techniques are used. Responses to the open-ended questions asked during the interviews, were analysed through thematic data analysis. All 12 the respondents provided their opinions which were used to address the research questions that guided this study. Key issues that were revealed in this chapter show that the concept of knowledge management was relatively new but was gaining recognition in academic libraries. With reference to RFID technologies, respondents had limited knowledge, but their response showed confidence in the subject area under investigation because RFID technologies were already in use at the Unisa academic library. Respondents provided positive feedback that was relevant and in line with the aim of this study.

Different company reports, industry trends, the RFID technology landscape and other empirical studies were consulted to discover the topical issues relating to RFID and KM in libraries. Most of the views raised by respondents were supported by the contents of the Unisa library as well as the literature consulted for this study. The conclusions and recommendations will be presented in the next chapter.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the conclusions and recommendations will be discussed and presented. The focus is on presenting summaries of literature review and primary study findings and ascertaining any synergies or common themes that helped to address the research questions and objectives for the study. The concept of RFID technologies in academic libraries is a new concept that is not widely understood; however, literature review has shown that firms are moving towards digital technologies to enhance organisational performance and manage knowledge effectively and efficiently as shown by the discussions in previous chapters. The findings from the study will be discussed in three sections, namely: literature review, primary study and content analysis and a narrative of the conclusions. The recommendations will be based on the conclusions and the chapter will be concluded.

5.2 Findings from the study

Research findings are discussed in two sections, namely: literature review and primary study. It is important to identify and discuss the key tenets that emerged from reviewing or looking at what other scholars have said or established in their studies. By explaining key concepts in the study, it becomes easier to synthesise ideas from literature with ideas presented in the current study, which results in the generation of new knowledge.

5.2.1 Findings from literature review

The findings from literature were varied in depth and understanding of the concept of RFID technology and how it enhances knowledge management. It was established that firms, specifically libraries, were moving towards digital technologies to preserve information resources. Katz (2015) indicates that due to social transformation triggered by digital technologies, libraries and other firms were adopting digitisation to generate, process, share and transact information for day-to-day administration and made it accessible through digital technologies. Literature suggests that the movement towards digitisation was beneficial in many ways such as offering searching, browsing and comparison capabilities to internet users (Hughes, 2004). Information users have easier and better access to information in the digital world.

The study established that data, information and knowledge were distinct concepts but very closely related. Data were defined as raw facts which do not convey any meaning, but when meaning was added, data became information that was vital for knowledge creation (Wang et al., 2001). Modern firms stored data on some sort of technology system by departments for easier management, retrieval and control. Information is the result that people obtain after the process of gathering, organising, adjusting and analysing the raw data. Knowledge is an important aspect of an organisation, hard as it may be to contextualise and put into perspective. The reason why knowledge is difficult to contextualise is because it is fluid. Knowledge is the experience that people have by virtue of doing their work.

Different knowledge management practices were revealed in this study because firms operated in a rapidly changing economic environment. With the intensity of competition for market share, recognition and the need to remain relevant, the introduction of KM practices has been suggested as the answer to some of these problems. This is in terms of the utilisation of knowledge to make management decisions to improve internal document management and exploitation to increase the level of knowledge dissemination and the utilisation of knowledge for qualitative change in the provision of information services. KM practices include: creation and acquisition. Knowledge creation has been defined as the process of making tacit knowledge available (Nonaka, 2000), while knowledge acquisition entails sharing of knowledge among peers. Knowledge creation is considered as an important role of learning and innovation for an organisation's success and survival in the market (Soo et al., 1999).

The study established that knowledge sharing in organisations is becoming more important and there are efforts to invest in KM solutions. In academic libraries, RFID technologies were adopted to enhance processes and management of knowledge. Knowledge sharing platforms help organisations integrate vast assortments of disparate applications which enable information sharing while creating a centralised knowledge management approach across the organisation. Collaboration technologies support virtual meetings, subject expert repositories, image galleries, instant messaging, wireless web services, training and e-mail management.

Knowledge retention was revealed as one of the KM practices prevalent in organisations because firms used all systems and activities to capture and preserve knowledge and allow it to remain in the organisational system once introduced. The knowledge and expertise of employees should be retained before they leave the organisation. In the absence of knowledge

retention strategies, organisations lose tacit knowledge due to various forms of attrition, such as when employees leave for other organisations. The awareness of knowledge loss through staff attrition is prompting companies to institutionalise certain processes to capture as much knowledge from their employees as possible (Chigada, 2014).

It was revealed that the use of KM solutions such as RFID should be considered for the purpose of preserving organisational knowledge assets. There is a high probability that academic libraries could lose corporate memory in various ways and it is sometimes difficult to detect the loss, as there are no systems to help track and combat knowledge loss. RFID systems have capabilities to retain information and interact with other systems while sharing information. RFID systems are scalable and integrated into enterprises resources planning (ERP) systems (Becerra & Fernandez, 2004). Thus, it was established that KM was beneficial to the academic library or firm through improved sharing of information to reduce the reporting burden, shared knowledge among different people, improved efficiency and effectiveness, improved services, improved record keeping, inventory management and facilitation of interdisciplinary research.

Key KM enablers were recorded as the existence of an organisational culture which is well understood by all employees, organisational structure with clearly defined roles and responsibilities. Human capital is the knowledge, expertise, skills or characteristics of the worker that contribute to the productivity of the organisation. This human capital brings about competitiveness in organisations and, as the competition for talent continues, organisations around the world are trying to figure out alternatives to hierarchical organisational structures, for example, which do not necessarily promote knowledge exchange (Morgan, 2015). Every organisation needs leadership. In organisations, leaders help to steer the organisation in the right direction to achieve its intended goals and objectives. Leadership helps to create and instil the right morale and environment for the implementation of knowledge management practices.

Organisations should have KM systems, which are structures for creating dynamic organisations for learning, resulting in rapid responses to the changing business environment, continuous improvement and innovation, and improved bottom-line results (Wang et al., 2001:265). KM systems aid the implementation of KM practices. The existence of KM systems should be in line with overall organisational KM strategy and vision to ensure efficiency and effectiveness of the KM strategy.

The second part of literature review focused on the adoption and use of RFID technologies. It was revealed that the construction industry was the leading industry in the use of RFID technologies because construction projects face some critical challenges, namely cyclical demands, the fluctuating costs of materials, a significant number of changed orders per project and a rather authoritarian environment based on the chain of command, therefore RFID technologies are paramount in this industry. RFID technology can be considered as a major innovation with the potential to offer many new opportunities for construction companies to improve communication, facilitate teamwork, improve information management skills, and encourage greater cross-fertilisation between business processes (Bowden et al., 2005).

It was revealed that RFID is positioned as “an emergent technology for real-time tracking of any product, module, system and, eventually, any component as they move along the various layers of supply chains and one of today’s fastest growing technologies in terms of scope of application in the next generation of business intelligence” (Chen, Tsai & Liu, 2008). RFID is an enabler of maintenance management because managers can efficiently track information related to components, materials and equipment from the production/construction phase to operations and maintenance is a challenge in the industries. RFID technologies are used to identify equipment automatically and to integrate related information with equipment in various industries. The study revealed that the use of RFID can extend beyond the needs of assets management. There was an ability to accurately track movable assets, which eliminates the frustration of having to physically locate them and helps to avoid unnecessary “just-in-time” purchases when “missing” assets are assumed to have been disposed of. A future vision of RFID includes the “Internet of Things,” which refers to a global network of computers and objects in which computers are able to identify and store information instantly on any object, anywhere in the world (Teresko, 2003). RFID is believed to offer many benefits in supply chain management, including shrinkage reduction, material handling efficiency and increased product availability.

5.2.2 Findings from Primary Study

The primary study findings are presented in this section. An inductive thematic data analysis was performed in this study because various themes emerged during the data collection process. The findings were guided by the research questions which were restated in the previous chapter.

5.2.2.1 Demographics of Respondents

It is important to discuss the demographics of respondents to mitigate any challenges that might be raised regarding the findings of this study. Twelve respondents were selected using the non-probability purposive sampling technique because the respondents were in key strategic management positions and were privy to information regarding the academic library and its processes. Therefore, it became apparent that these respondents possessed relevant data required to address research questions for the study. Four respondents were white and the rest (8) of the respondents were black. A detailed discussion of the demographics was presented in section 4.1 in chapter four. It should be noted that 15 open-ended questions were asked during the face-to-face interviews and nine themes emerged from the interviews. These themes were discussed and interpreted as follows:

5.2.2.2 Understanding of the concept of knowledge management

The first theme sought to establish respondents' understanding of the concept of KM. From the responses gathered, it was evident that participants understood KM to be a way of sharing information, exchanging ideas using different media and to a great extent, KM encompassed many things. The level of understanding was captured in this extract:

"... [K]nowledge management depends on tapping the tacit and often highly subjective insights, intuitions and hunches of individual employees." [Participant MA006]

Wang et al. (2001) explain that in today's economies, organisations are using organisational knowledge to leverage organisational assets and create value from it. In the knowledge economy, knowledge has become the basic form of capital. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices and norms. The overall viewpoint was that the concept of KM was well understood, thus, allowed the continuation of the interviews. If the participants had indicated a lack of understanding of the concept, it would have been difficult to proceed with the rest of the questions.

5.2.2.3 Key issues about knowledge management

In this theme, the study sought to establish the key issues associated with KM. Participants indicated the existence of two types of knowledge; KM was a relatively new concept. One participant stated that KM was not the same as data, information or wisdom but was unique in

its application. Interesting, participant six stated that: “[K]nowledge management is a relatively new concept which is often misconstrued to mean information technology. Knowledge management is superior or encompasses information science, information technology, business management and it is these issues that impede the phenomenal growth of the profession.”

The views by participant MA006 succinctly summarised the views raised by the other 11 participants because the response covered all key precepts of KM. Mostert and Snyman (2003) state that successful organisations are knowledge-creating organisations which produce, disseminate and embody new knowledge in new products and services, and find ways to better deliver those products and services for the growth of the organisation. In the knowledge economy, knowledge has become the basic form of capital. Economic growth is driven by the accumulation of knowledge and knowledge is used in organisations to make money. Through the implementation of KM practices and technologies, academic libraries are poised to deliver the best possible services, function effectively and operate in environments characterised by transparency and accountability.

5.2.2.4 Level of involvement in knowledge management

The third research question sought to establish participants’ levels of involvement in KM. Some participants indicated that they engaged in KM activities on a daily basis through meetings, discussions with their colleagues and the use of routines and processes. While other participants stated that working with experienced and knowledgeable colleagues allowed them to tap into tacit knowledge. One participant stated that interacting with colleagues, students and academics exposed them to tacit knowledge. The views by participant 12 capture the key issues stated by the other participants through the following extract: “I engage in meetings, teleconferences and electronic discussions and other social interactions ... I engage students, colleagues and academics on various topics and get appropriate information resources.” [Participant MA012].

Participants engaged in KM at different levels and most of the interactions were through meetings and face-to-face discussions. Through dialogues, discussions, experience sharing and observation, tacit knowledge is amplified at group or organisational level. Tacit knowledge represents knowledge based on employees’ competences, experiences and skills (Jacobs & Roodt, 2007).

5.2.2.5 Knowledge management in the workplace

The study sought to establish the knowledge management practices at the workplace because participants had shown their understanding of the concept and had also mentioned what KM activities they were involved in. Key KM practices pointed out during the interviews included departmental meetings; interaction with information users such as students and academics; use and adoption of routines, processes, databases and cataloguing. Other participants indicated that KM practices included retaining knowledge in databases. The views by participants were supported by Andreeva and Kianto (2012:618) who explain that “KM practices refer to the aspects of the organisation that are manipulable and controllable by conscious and intentional management activities.” Knowledge processes naturally exist in organisations, irrespective of any management efforts. Knowledge processes involve knowledge creation, sharing, acquisition, transfer and application. In the university setting, this is practically part of the core business of a university. After making clear sense of knowledge sharing, the researchers and scholars are required to develop the sense of creation.

5.2.2.6 Knowledge management challenges at the academic library

In this theme, respondents' views were sought regarding the challenges confronted at the academic library. As an information resources centre, the academic library was confronted by different operational challenges. Participants stated that resistance to change is a key challenge that confronts many organisations. Some employees can resistance change for fear of the unknown and this is prevalent when top management is not transparent or fails to communicate the objectives of the change programme clearly. When RFID technologies were introduced, employees resisted change. Other participants stated that since KM was a relatively new concept, there was also a need for top management to communicate and train employees on the concept. The absence of a formal KM strategy in the library created more challenges because there was no formal process or procedure to guide KM initiatives. There was mass exodus of staff at the academic library, resulting in a loss of tacit knowledge. A lack of synergistic approaches creates disharmony between systems. Literature states that knowledge sharing platforms help organisations integrate vast assortments of disparate applications which enable information sharing while creating a centralised knowledge management approach across the organisation. Collaboration technologies support virtual meetings, subject expert repositories, image galleries, instant messaging, wireless web services, training and e-mail management (Hedgebeth, 2007:51). The knowledge and expertise of employees should be retained before they leave the organisation. In the absence of knowledge retention strategies, organisations lose

tacit knowledge due to different kinds of attritions such as when employees leave for other organisations.

5.2.2.7 Digitisation to improve record keeping

Respondents were asked to indicate how digitisation enhanced record keeping. The main objective of digitising was to preserve information resources. Respondents indicated that: “To preserve data and information stored on paper records and files. Combining technical information and cataloguing, metadata allows the digitisation of resources vital to access and search where metadata is a set of data that describes and gives information about a data.”

In addition to the preservation of data, digitisation was undertaken to permit *interoperability* and facilitate collection management in the future. Together with metadata, standardisation and formatting renders effective retrieval of information, cross searching with other online resources by using appropriate thesauri and standardisation. With reference to the notion that the world has become a global village, moving towards a digital world was one of the objectives of digitisation. The project focused on user needs of the institution as well as response to information users. Traditional information and record-keeping systems were no longer reliable, resulting in loss of vital information, therefore, it was decided to move towards a digital working space. RFID may be used in a way that replaces traditional barcodes for the storage of item identification and other data. Staff and library users are able to interact with library materials in ways that enhance efficiency and reduce repetitive handling of materials. The library applications employ what are essentially smart labels with adhesive backing and memory capacities sufficient to store the item identifier, usually equivalent to the barcode number, together with other information required such as institutional identifier, media code or call number.

5.2.2.8 Capabilities of RFID technologies in academic libraries

In this research question, the study sought to establish respondents' views regarding the capabilities of deploying RFID technologies in academic libraries. Different responses were provided; however, it was revealed that RFID technologies were needed now more than ever before. Participants stated that with RFID systems in place, it was easier to track and trace the movement of information resources, provide easy inventory management, and provide accurate and up-to-date information regarding purchased information resources. Other participants stated that RFID systems provided large storage facilities; helped improve communication,

facilitated team work, improved information management skills, reduced unnecessary JIT purchases and enabled managers to physically locate movable assets. The widespread use of RFID could automate the tracking of pallets, cases, individual products, as well as reusable assets such as bins and containers throughout the supply chain. With RFID, collection of real-time data on individual items could become a reality, which was not possible with the use of bar codes. A future vision of RFID includes the “Internet of Things”, which refers to a global network of computers and objects in which computers are able to identify and store information instantly on any object, anywhere in the world (Teresko, 2003). There is competition from other sources such as the internet, thus information users can access latest information on the internet.

5.2.2.9 Skills required to utilise RFID technologies

From the discussions that ensued during the interviews, participants kept on stating that RFID technologies require special skills. Key suggestions from the respondents were the need to have basic computing skills, as well as analytical, technical and adequate RFID training. Key issues that emerged from this question were that there was a new generation of information users that advocates for technology and it was highly likely that the internet was now the preferred information resource centre. Additionally, digitisation was a new way of collecting and analysing data while providing platforms for engaging customers in the innovation process (Woetzel et al., 2016). Therefore, it was evident that staff needed training and development to acquire appropriate skills in order to serve a new generation of information users.

5.2.2.10 Challenges confronted in using RFID systems

As a follow-up to the above theme related to skills required to fully utilise RFID, participants were asked to state challenges faced when using these systems. The study revealed that there was a need for top management to consult and engage employees before implementing changes. A lack of RFID knowledge, skills and inadequate training contributed significantly to RFID use. Participants also stated that a lack of communication and reluctance to share knowledge played a significant role in the use of RFID. In the PWC report (2012), it was noted that a lack of ICT skills impacts negatively on digitisation mainly in the socio-economic area where there was growth in the economy like GDP growth, job creation and innovation, and in the societal well-being of a country like quality of life, access to basic health services. Respondents agreed with the views of Raju (2014) that users of the system at the academic libraries were still required to receive extra training and obtain extra skills to be able to use the

new system. The economic value of the new system could only be realised if the system was utilised optimally.

5.3 Content analysis

In this third section of summary findings, industry and company reports and other sources were analysed to determine the trends in RFID systems and what progress had been made in other firms. It was reported that the objective of RFID use in academic libraries was to enhance efficiency and organisational performance, therefore, there was a need to migrate from the traditional library system to a digital system to help preserve the intellectual contents of the digital objects and retain the ability of users to keep on using online information through constant technological change (Unisa, 2015). Migration ensures that content of the file is frequently moved from one file to another and from one format to another and updates the information so that it is consistent with the recent technology change.

In line with the nature of how libraries operate, there is a dire need to improve the monitoring, securing, tracking and tracing of library information resources to support meaningful decision-making. In the knowledge economy, it has become important for managers to see the benefits of focusing on knowledge assets over traditional assets in order to enhance and sustain organisational competitive advantage. The sustainability of a competitive academic library flows from the creation, ownership, protection and storage of difficult-to-imitate knowledge assets. The only way to achieve competitive advantage is by embracing knowledge management and there are various enablers that enhance the adoption of knowledge management, namely, ICTs, organisational culture, leadership and strategy.

The underutilisation of RFID technologies impedes the provision of relevant, accurate and timeous information to assist LIS managers to establish knowledge management practices and processes that create an enabling knowledge management environment. The global advancement of technology is compelling proponents of RFID to increasingly converge with other technologies such as sensors, GPS and GSM to provide accurate real-time location and environmental information ((Venture Development Forum (VDF), 2005).

5.4 Conclusions

The conclusions from the above findings were as follows:

- i. There is a growing trend for firms driving towards digitisation of processes. Some of the change projects are decided upon and implemented without consulting all stakeholders, hence the challenges that arise.
- ii. Various challenges such as costs of digitising, training, lack of project management skills, resistance to change, the need for technical and specialist skills impeded the full utilisation of RFID systems.
- iii. In recent years, organisations are adopting and implementing digital technologies for records management, document management, workflow and imaging software. Unlike just any information systems, electronic record-keeping systems support efficiency and accountability through the creation, management and retention of meaningful, accurate, reliable, accessible and durable evidence of organisational activities and decisions.
- iv. The benefits of ICT in libraries are numerous and these include: rendering work easier, faster, cheaper and more effective. In this perspective, libraries help to manage information overload and make retrieval of information easier in computerized systems. Likewise, digitised libraries also save physical space, reduces cost of paper and enable remote access through a network system. Digitisation helps preserve higher education through ICT, preserve quality and allow wider access.
- v. Digitisation also creates new high-skilled and value-added jobs with more flexibility. Additionally, digitisation is a new way of collecting and analysing data while providing platforms for engaging customers in the innovation process.
- vi. There are long-term benefits to this digitisation project. For example, paper records get damaged very easily and information resources are lost. The digitisation project is in line with global trends of digital archiving. Digitisation creates opportunities for innovation in record keeping.
- vii. Firms are developing KM strategies to ensure that organisational knowledge assets are preserved or retained before they are lost. In the knowledge economy, it has become important for managers to see the benefits of focusing on knowledge assets

over traditional assets in order to enhance and sustain organisational competitive advantage.

- viii. KM practices included meetings, routines, databases, processes and face-to-face interactions among colleagues.
- ix. Lack of formal KM strategies impeded knowledge management practices. However, participants were involved in KM on a daily basis.
- x. The underutilisation of RFID technologies impedes the provision of relevant, accurate and timeous information to assist LIS managers to establish knowledge management practices and processes that create an enabling knowledge management environment.
- xi. It was reported that the objective of RFID use in academic libraries was to enhance efficiency and organisational performance, therefore, there was a need to migrate from the traditional library system to a digital system to help preserve the intellectual contents of the digital objects and retain the ability of users to keep on using online information though constant technological change

5.5 Recommendations

With reference to the conclusions drawn from the findings above, the following recommendations were made. These findings might be applicable to the current or other future studies and organisations planning to convert their current systems to the digital world.

5.5.1 Adoption of RFID systems in line with overall university objective

The analysis of the literature review, primary study and analysed annual reports showed that there was no alignment between RFID systems and the overall university objective. The university's reports did not state much in relation to how the academic library was being transformed into a modern library aligned to regional or global academic libraries. There is a trend towards transforming the traditional university library into a global information resource centre. In this study, it is recommended that the adoption of RFID system should be aligned to the university's overall objective of transforming the academic library into a world-class information resources centre. By transforming the academic library, more information users

will be attracted to using the library. One of the challenges raised in this study relates to information users resorting to the use of the internet to access the latest information, thus, there is little traffic towards the traditional library. Adopting RFID systems in line with university objectives might gain recognition and buy-in from other interested stakeholders and investors who might spend considerable amounts of financial, time, knowledge and information resources.

5.5.2 Top management should be open and communicate new project concepts, the hide-and-seek approach exacerbates problems

Respondents indicated that the RFID project was imposed on employees, resulting in some friction and resistance to the project. Brown (2011) states that change is inevitable in the contemporary business environment, therefore management should put contingency measures in place to deal with change as it occurs. It is the responsibility of management to ensure that change is managed strategically to mitigate losses and missed opportunities that could accrue from change. In this study, it was revealed that management was not open and did not communicate the digitisation project on time. This study also recommends that a communication strategy should be put in place prior to commencement of any project. Proper and open communication diffuses mistrust between parties. Communication should create opportunities for dialogues and question-and-answer sessions so that a common position is taken to achieve the desired objectives.

5.5.3 Adequate training and development

It was revealed that appropriate deployment of technology is likely to improve knowledge management practices in academic libraries as well as service quality and efficient operations. One approach that is gaining popularity is the adoption of RFID, which has made significant economic impacts in many industries, especially in academic libraries where the uptake of technology has been at a slower pace (Uniform Code Council, 2006). The sustainability of a competitive academic library flows from the creation, ownership, protection and storage of difficult-to-imitate knowledge assets. The only way to achieve competitive advantage is by embracing knowledge management and there are various enablers that enhance the adoption of knowledge management, namely, ICTs, organisational culture, leadership and strategy. Despite the RFID systems being in place, the underutilisation of the systems poses major challenges for the Unisa library. Library staff are unable to generate timeous and accurate reports. The underutilisation of ICTs and RFID technologies has compelled library staff to revert to manual

systems that impede the monitoring and controlling, movement, and tracking and tracing of information resources in the institution's various academic libraries. The study recommends that users of the system at the academic libraries were still required to receive extra training and obtain new skills to be able to use the new system. When users receive adequate training development, the economic value of the new system could only be realised if the system was optimally utilised.

5.5.4 Towards a knowledge-based approach

The study revealed that KM practices refer to the aspects of the organisation that are manipulable and controllable by conscious and intentional management activities. Knowledge processes naturally exist in organisations, irrespective of any management efforts. Knowledge processes involve knowledge creation, sharing, acquisition, transfer and application. In the university setting this is practically part of the core business of a university. After making a clear sense of knowledge sharing, the researchers and scholars are required to develop the sense of creation. Managers were moving towards knowledge-based approaches as opposed to traditional management of capital and other organisational assets. Chigada (2014) states that managing knowledge envisages the development and implementation of a KM strategy that supports the overall firm's vision. The recommendation is that management at the university can establish the KM strategy and share it with all employees and other stakeholders. Academics and students can make invaluable input, while industry can contribute with best practices. A knowledge portal will then compel training and development to all. A knowledge-based approach will involve everyone in the university, thus, it will be easier to implement new systems and technologies.

5.5.5 Knowledge management practices

It was revealed that routines, databases, meetings, face-to-face interactions and procedures were some of the key KM practices. Respondents stated that there were no formal structures or procedures to manage knowledge. When new systems were introduced, there was an exodus of staff, therefore a loss of tacit knowledge. Had there been any knowledge retention strategies, tacit knowledge would have been retained. It has been acknowledged that some KM practices do exist; however, there is a dearth of information to show that knowledge is stored and acquired or reused as and when needed. The study recommends that a formal KM structure should be developed in line with the recommendations made in 5.6.4 above. Knowledge management practices will then be developed in line with the KM strategy or policy. Meetings

would be recorded and minutes can be referred to in future. The absence of KM practices creates loopholes or opportunities for loss of knowledge. For example, succession planning policies should be designed to capture and transfer tacit knowledge before it leaves the organisation or lost when staff resigns or leaves the organisation.

5.5.6 Top management support and commitment are required for projects to succeed

One of the issues that curtail projects is the absence of management visibility and commitment to projects. Top leaders should articulate project visions and strategic goals and provide guidance. Respondents and literature review highlighted the absence of management. Management supports through mobilisation of resources and motivation and rewards. Therefore, it is recommended that management should abstain from politics and focus on the project at hand. Leadership has a responsibility to clearly articulate the strategic goals of the immovable asset register. It is recommended that workshops, seminars and other fora be established to engage and involve users on the goals of the immovable asset register. Once clarity has been provided, everyone would be on the same level of understanding. The digitisation project is a complex and difficult project to understand where inexperienced project teams have been assigned. It is recommended that the project management consultants be consulted in the implementation of this system.

5.6 Areas for further study

This study focused on how RFID technologies enhanced or played an important role in enabling knowledge management practices at the Unisa academic library. The assumption was that other functional areas could have been automated already. However, the exodus of staff and resistance to change might be used as the starting point to investigate whether top management consulted or engaged all stakeholders before implementation of RFID technologies. If there were proper consultations, the level of resistance to change would have been minimal because RFID and other digitisation projects would not be the first major change programmes initiated at Unisa. It is suggested that further research could be conducted to establish how change programmes have managed before in other departments or sections and how the staff exodus was managed. An organisation-wide research would be recommended to ascertain the views and opinions of a larger population so that findings can be generalisable. In this study, 12 participants were selected to partake in the study, thus, top management was excluded from the study who could have provided a different perspective of RFID deployment at the academic library.

The study also recommends a different research methodology other than a qualitative approach so that a larger sample size is included. As pointed out above, potential participants could have been left out of this study, yet they possessed vital information that could have resolved some of the research questions. Literature states that RFID technologies are becoming popular in supply chain management environments and other firms. Little has been said about academic libraries. A joint research project with other universities in South Africa would suffice to bring a holistic understanding of how RFID systems can transform the traditional academic library into a global information resource centre. The findings from another institutions might be compared with the findings from the present study, discrepancies will be noted and appropriate corrective action could be taken.

5.7 Conclusion

In the first chapter of the study, the focus was on providing an introduction, motivation and statement of the problem. The research aim was to investigate how RFID technologies can enable knowledge management at the University of South Africa's academic libraries and to suggest ways how these technologies may be enhanced to improve knowledge management. In order to achieve the research objective, various research questions were developed to guide the study. The researcher delved into the body of literature by collecting information from various sources. In the literature review chapter of the study, various concepts of KM and RFID systems were discussed, resulting the synthesis of ideas and arguments from different scholars infused in the current study. RFID was defined as a means of identifying a person or object using waves to communicate within a system of integrated circuits, tags, readers and software to identify items. RFID refers to the technology in which the RFID tag transmits a radio frequency signal that is picked up by a reader. By discussing the concepts, an in-depth understanding of RFID and KM generated new knowledge and theory which might be adopted. A qualitative research approach was used to collect, analyse and interpret data for the study. Face-to-face interviews were conducted as well as document analyses to determine activities occurring in a natural setting – the UNISA academic library. Data were collected through an inductive face-to-face process where respondents were asked to provide views in their own words. There was a need to process raw data and produce meaning for informed decision-making.

The findings of the study were discussed with constant reference to the literature review to establish the relationships or disagreements between primary study and literature. In most of the discussions, there existed strategic fits between what had been said before and what respondents were experiencing. The interpretation and analysis of data resulted in themes that were transcribed and analysed to arrive at some meaning. The conclusions and recommendations were made in this last chapter of the study. From the first chapter to the last chapter, the guiding principle/thread was how RFID enabled KM in an academic library. The aim of the study was achieved because each research question was addressed to the satisfaction of the researcher. The research objectives were achieved through the interpretation of each theme with constant reference to the literature review while ascertaining convergence between literature and respondents' views. It was then concluded that the research aim was achieved.

REFERENCES

- Ahsan, K., Shah, H. & Kingston, P. 2009. *Context based knowledge management in healthcare: An EA approach*. MACIS, AIS.
- Ahsan, K., Shah, H. & Kingston, P. 2010. *Knowledge management integration model for IT applications with hooking RFID*. MACIS, AIS.
- Al-Mousawi, H. (2004), "Performance and reliability of Radio Frequency Identification (RFID)", available at:
http://student.grm.hia.no/master/ikt04/ikt6400/g28/Document/Master_Thesis
- Al-Oquily, A.T., Hassan, Z.B., Rashid, A.M., & Al-Sulami, Z.A., 2014. Success Factors of Knowledge Management in Universities (a case study: Jordanian private universities). *Middle-East Journal of Scientific Research*, 22(7): 994-1002.
- Alavi, M. & Leidner, D.E. 2001. "Review: knowledge management and knowledge management systems: conceptual foundations and research issues". *Management Information System Quarterly*, 25(1): 107-136.
- Albers, J.A. 2009. "A practical approach to implementing knowledge management". *Journal of Knowledge Management Practice*, 10(1): 1-8.
- Allee, V., 1997. *The knowledge evolution: exploring organizational intelligence*. Boston, MA: Butterworth-Heinemann.
- Andreeva, T. & Kianto, A., 2012. Does Knowledge Management Really? Linking Knowledge Management, Competitiveness and Economic. *Journal of Knowledge Management*, 16(4):617-636
- Angeles, R. 2005. "RFID technologies: supply-chain applications and implementation issues." *Information Systems Management*, 22(1): 51-65.
- Argyris, C. 2013. *Knowledge for action*. San Francisco: Jossey-Bass.
- Arntzen, A. A., Worasinchai, L. & Ribiere, V. M., 2009. An insight into knowledge management practices at Bangkok University. *Journal of Knowledge Management*, 13(2):127-144.
- Aubert, H. 2011. "RFID technology for human implant devices". *Comptes Rendus Physique* 12(7): 675-683.

- Ayre, L.B. 2012. "Library RFID Systems for Identification, Security, and Materials Handling". *Library Technology Report*, 48(5): 9-16.
- Ayre, L.B. 2012, "Moving Your RFID System to the New US Data Profile". *Library Technology Reports*, 48(5): 27-35.
- Ayre, L.B. 2012. "RFID Standards" *Library Technology Reports*, 48(5): 20-26.
- Babbie, E. 2010. *The practice of social research*. 12th ed. Southbank, Victoria: Wadsworth/Thompson.
- Babbie, E. & Mouton, J. 2001. *The practice of social research*. Oxford: Oxford University Press.
- Becerra-Fernandez, Irma, and Rajiv Sabherwal. 2004. Organizational knowledge management: A contingency perspective. *Journal of Management Information Systems*, 18 (1): 32–55.
- Bendavid Y, Lefebvre E, Lefebvre LA and Fosso Wamba S., (2009). Key performance indicators for the evaluation of RFID-enabled B-to-B e-commerce applications: The case of a five-layer supply chain. *Information Systems and E-Business Management* 7(1): 1-20.
- Bhuptani, M. & Moradpour, S. 2005. *Deploying Radio Frequency Identification Systems*, 1st ed., Berkeley, California: Pearson Education, Prentice Hall.
- Bhursry, M. & Ranjan, J., 2012. Enhancing the teaching-learning process: a knowledge management approach. *International Journal of Education Management*, 26(3): 313-329.
- Boland, R.J. & Tenkasi, R.V. 1995. *Perspectives Making and Perspectives Taking in Communities of Knowing*. *Organisation Science*, 6(4): 350-372
- Bollinger, A.S. & Smith, R.D. 2001. "Managing knowledge as a strategic asset". *Journal of Knowledge Management*, 5(1): 8-18.
- Bowden, S., Dorr, A., Thorpe, T. & Anumba, C., 2005. Mobile ICT support for construction process improvement. *Automation in Construction*, 15(5): 664-676.
- Braun, V. & Clarke, V. 2006. "Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning". *The Psychologist*, 26(2): 120-123.
- Brown D.R. 2011. *An experiential approach to organisational development*, 8th ed. New Jersey: Pearson International.

Bryman, A., 2012. The Sage Handbook of Organisational Research Methods, 4th Edition, Oxford University Press, London.

Bryman, A. & Bell, E. 2007. The nature of quantitative research. In: *Business Research Methods*. New York: Oxford University Press.

Burnell, J. 2008. "What is RFID Middleware and where is it needed?". Available at: <http://www.rfidupdate.com/articles/index.php?id=1176>.

Burns, N. & Grove, S.K. 2005. The practice of nursing research conduct, critique & utilization. 5th ed. St. Louis, Mo.: Elsevier. 780 p.

Burton, N., Brundrett, M. & Jones, M., 2008. Doing your education research project. London: Sage Publications Ltd.

Bushaway, R.W. 2009. Managing research. Berkshire, GBR: McGraw-Hill Education.

Butters, A. 2008, "RFID in Australian Academic Libraries: Exploring the Barriers to Implementation". *AARL*, 39 (3)198-206.

Campbell, D.T. & Fiske, D.W. 1959. Convergent and discriminant validation by the multi-trait multi-method matrix. *Psychological Bulletin*, 56: 81-105.

Cavalleri, Th. Dekorsy, H. H. W. Chong, J. C. Kieffer, and R. W. Schoenlein
Phys. Rev. B 70:16, 161102(R) – Published 13 October 2004: Evidence for a structurally-driven insulator-to-metal transition in VO₂: A view from the ultrafast timescale.

Chakraborty, R., Roy, S. & Jandhyala, V. 2011. "Revisiting RFID Link Budgets for Technology Scaling: Range Maximization of RFID Tags". *IEEE Transactions on Microwave Theory & Techniques*, 59(2): 496-503.

Chao, C-C., Yang, J.M. & Jen, W. 2007. "Determining technology trends and forecasts of RFID by a historical review and bibliometric analysis from 1991 to 2005". *Technovation*, 27(5): 268-79.

Chen, K., Tsai, H., Liu, Y.Y. (2008). Development of the RFID System for nuclear materials management. In *Proceedings of the 49th INMM Meeting*, Nashville, TN, July 2008.

- Chigada, J.M. 2014. "The role of knowledge management in enhancing organisational performance in selected banks of South Africa". PhD Thesis. Pretoria: University of South Africa.
- Ching, S.H. & Tai, A. 2009 "HF RFID versus UHF RFID -- Technology for library service transformation at City University of Hong Kong". *Journal of Academic Librarianship*, 35(4): 347-359.
- Chua, A. 2003. "Knowledge sharing: a game people play". *Aslib Proceedings*, 55 (3): 117-129.
- Cohen, L. 2007. *Research methods in education*, 5th ed. New York: Routledge.
- Collins, J. & Hussey, R. (2009). *Business Research: A Practical Guide for Undergraduate & Postgraduate Students*. 3rd ed., London: Palgrave Macmillan.
- Cong, X. & Pandya, K. 2003. "Issues of KM in the public sector". *Electronic Journal of Knowledge Management*, 1(2): 25-33.
- Conneely, K., 2009. Managing corporate assets with RFID. *Assembly Automation*, 29(2): 112 - 114.
- Connelly, C.E. & Kelloway, E.K. 2003. "Predictors of employees' perceptions of knowledge sharing cultures". *Leadership and Organization Development Journal*, 24(5): 294-30.
- Coyle, K. 2005. "Management of RFID in libraries". *Journal of Academic Librarianship*, 31(5): 486-489.
- Cozby, P.C. & Bates, S.C. 2012. *Methods in behavioural research*, 11th ed. California: McGraw Hill Higher Education.
- Creswell, J.W. 2007. *Qualitative enquiry and research design: choosing among five approaches*. 2nd ed. Cengage Learning. Los Angeles, CA: Sage Publications, Inc.
- Creswell, J. W., 2009, *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. 3rd edition, Thousand Oaks, CA: Sage.

- Creswell, J.W. 2010. *Research design: qualitative, quantitative and mixed methods approaches*, 3rd ed. Cengage Learning. Los Angeles, CA: Sage Publications, Inc.
- Creswell, J.W. 2012. *Research design: qualitative, quantitative and mixed methods approach*. Thousand Oaks, CA: Sage.
- Creswell, J.W. 2014. *Research design: qualitative, quantitative and mixed methods approach*. Thousand Oaks, CA: Sage.
- Cunningham, J.B. 1993. *Action research and organisational development*. London: Praeger.
- Davenport, T.H. & Prusak, L. 1998. *What's the big idea?* Boston: Harvard Business School Press.
- Davenport, T.H. & Prusak, L. 2003. *What's the big idea?* Boston: Harvard Business School Press.
- Denscombe, M. 2007. *The good research guide: for small-scale social research projects*, 4th ed. Maidenhead: Open University Press.
- Denzin, N.K. & Lincoln, Y.S. 1994. *Handbook of qualitative research*. London: Sage.
- Dewah, P. 2011. *Knowledge retention strategies in selected southern African public broadcasting corporations*. University of Fort Hare. Available at: <http://hdl.handle.net/10353/438> (Accessed: 25 September 2017).
- Drucker, P.F. 1998. The coming of the new organization. In *Harvard Business Review of Knowledge Management*, 1-19.
- Dutta, K., VanderMeer, D. & Ramamritham, K. 2011. "Managing RFID events in large-scale distributed RFID infrastructures". *Information Technology & Management*, 12(3): 253-272.
- Eisma, A., 2008. Data capture in IMB WebSphere Premises Server™, In: *OSGi Alliance*, 28.02.2011, Available from: http://www.osgi.org/wiki/uploads/CommunityEvent2008/23_Eisma.pdf. (Accessed 21 October 2016).
- Eisenhardt, K.M. 1989. Building theories from case study research. *The Academy of Management Review*, 14(4): 532-550.
- Eisenhardt, K., Schoonhoven, C.B. 1996. Strategic alliance formation in entrepreneurial firms: Strategic needs and social opportunities for co-operation. *Organizational Science*, 7(2): 136-141.

- Ergen, E., Akinci, B., East, B., Kirby, J. 2007. Tracking components and maintenance history within a facility utilizing radio frequency identification technology. *Journal of Computing in Civil Engineering*, 21(1): 11-20.
- Fisher, J.A. & Monahan, T. 2008. "Tracking the social dimensions of RFID systems in hospitals". *International Journal of Medical Informatics*, 77(3): 176-183.
- Floerkemeier, C. & Lampe, M. 2004. 'Issues with RFID usage in ubiquitous computing applications', *Lecture notes in Computer Science, Springer, Berlin, Heidelberg, New York*, vol. 3001:188-193.
- Floerkemeier, C. & Lampe, M. 2005. RFID middleware design: Addressing application requirements and RFID constraints, *Proceedings of SOC'2005 Smart objects conference*, 219-224, Grenoble France.
- Floerkemeier, C., Roduner, C. & Lampe, M. 2007. RFID application development with the Accada middleware Platform. *IEEE Systems Journal*, 1(2): 82-94.
- Fombad, M.C. 2009. Knowledge management in law firms in Botswana. Unpublished PhD thesis, Department of Information Science. Pretoria: University of Pretoria.
- Fouche, C. B. & Delport, C.S.T. 2009. Research at Grass Roots: Introduction to the Research Process. Pretoria: JL Van Schaik Publishers.
- Fowler, A. & Pryke, F. 2003. "Knowledge management in public service provision: the child support agency". *International Journal of Service Industry Management*, 14(3): 253-254.
- Gaffoor, S. & Cloete, F. 2010. "Knowledge management in local government: the case of Stellenbosch Municipality". *South African Journal of Information Management*, 12(1). Available at: <http://www.sajim.co.za> (Accessed 13 May 2017).
- Ghazali, Y.E., Lefebvre, E. & Lefebvre, L.A. 2012. "The potential of FRID as an enabler of knowledge management and collaboration for the procurement cycle in the construction industry". *Journal of Technology Management and Innovation*, 7(4): 1-34.
- Glasser, D.J., Goodman, K.W., & Einspruch, N.G. 2007. "Chips, tags and scanners: Ethical challenges for radio frequency identification". *Ethics and Information Technology*, 9(2): 101-109.
- Grant, K.A. & Grant, C.T. 2008. *Developing a model of next generation knowledge management*. Toronto: Information Science Institute, Ryerson University.

Grant, R.M. 2008. *Contemporary strategic analysis*, 6th ed. New York: John Wiley and Sons, Inc.

Hancock, B. 2002. *Trent Focus for Research and Development in Primary Health Care: an Introduction to Qualitative Research*. Trent Focus Group. University of Nottingham, Division of General Practice.

Hansen, M.T. 2002. Knowledge networks: explaining effective knowledge sharing in multiunit companies. *Organizational Science*, 13(1): 232-248.

Hansen, M., Nohria, N. & Tierney, T. 2001. What's your strategy for managing knowledge?. *Havard Business Review*, March-April: 106-112.

Hawking, S. 2011. *The greatest enemy of knowledge is not ignorance; it is the illusion of knowledge*. Available: <http://www.goodreads.com/author/quotes/1401/Stephen-hawking/html> (Accessed 19 December 2017).

Hedgebeth, D. 2007. "Maintaining competitive advantage in a knowledge-based economy through the utilisation of open source software". *Journal of Information and Knowledge Management Systems*, 37(3): 284-294.

Henttonen, K., Pussinen, P., Koivumäki, T. (2012). Managerial perspective on open source collaboration and net-worked innovation. *Journal of Technology Management & Innovation*, 7(3): 135-147

Howard, L. & Anderson M., 2005. "RFID Technology in the Library Environment". *Journal of Access Services*, 3(2): 29-39.

Hughes, L.M. 2004. *Digitizing collections: Strategic issues for the information Managers*. London: Facet Publishing.

Hyypia, M. and Parjanen, S. 2008. Boosting the creativity and communication in the innovation processes-preliminary results from the qualitative study. *Proceedings of the 5th international conference on intellectual capital and knowledge management*. New York: New York Institute of Technology, 225-232.

Ilie-Zudor, E., Kemeny, Z., Egri, D. & Monostroi, L. 2006. Identity-based, item-centric tracking platform for logistics applications. Computer and Automation Research Institute, Hungarian Academy of Sciences, 1111, Budapest.

Irick, L.M. 2007. "Managing tacit knowledge in organizations". *Journal of Knowledge Management Practice*, 8(3): 1-6.

Ishikawa, T., Yumoto, Y., Kurata, M., Endo, M., Kinoshita, S., Hoshino, F., Yagi, S., & Nomachi, M. 2003. "Applying Auto-ID to the Japanese Publication Business to Deliver Advanced Supply Chain Management, Innovative Retail Applications, and Convenient and Safe Reader Services", available at: <http://www.autoidlabs.org/uploads/media/KEI-AUTOID-WH004.pdf> (Accessed 29 February 2017)

Jacobs, E.J. & Roodt, G. 2007. "The development of a knowledge sharing construct to predict turnover intentions". *Aslib Proceedings: New Information Perspectives*, 59(3): 229-248. Available at: www.emeraldinsight.com/0001-253X.htm (Accessed 12 August 2016).

Jain, P. 2009. "Knowledge management in e-government". *Journal of Knowledge Management Practice*, 10(4): 1-10.

Jain, P. 2011. "Personal knowledge management: the foundation of organizational knowledge management". *South African Journal of Libraries and Information Science*, 77(1):1-14.

Johnson, R. B., & Christensen, L. B. 2004. Educational research: Quantitative, qualitative, and mixed approaches. Boston: Allyn and Bacon.

Kaare, K.K., Koppel, O. & Kuhi, K. 2012, "Wireless sensing in road structures using passive RFID tags". *Estonian Journal of Engineering*, vol. 18, no. 4, pp. 314-323.

Katz, R. 2015. *Using a Digitization Index to measure the Economic and Social Impact of Digital Agendas*. Columbia Institute for Teleinformation Working Paper.

Kidwell, J.J., Van der Linde, K.M. & Johnston, S.L. 2000. "Applying Corporate Knowledge Management Practices in Higher Education", *Educause Quarterly*, (4): 28-33.

Kim, M.P. 2005. *Knowledge retention enhances performance-based management*. Available at: <http://www.dcma.mil/htm> (Accessed 28 February 2012).

Kok, J.A. 2003. Role of leadership in the management of corporate knowledge. *South African Journal of Information Management*, 5(3): 117-120. Also available: <http://www.sajim.co.za> (Accessed 18 June 2017).

Kothari, C.R. 2004. *Research Methodology: methods and techniques*. 2nd rev ed., New Delhi. India: New Age International Publishers,

Kotiadis, K. & Robinson, S. 2008. Conceptual modelling: knowledge acquisition and model abstraction. In *Proceedings of the 40th Conference on Winter Simulation (WSC '08)*, Scott

Mason, Ray Hill, Lars Mönch, and Oliver Rose (eds.). Winter Simulation Conference 951-958.

Kumar, R. 2005. *Research methodology: step by step guide for beginners*. 3rded. Sage publications: London.

Laoufi, A., 2011. Using knowledge management in higher education: research challenges and opportunities. *Journal of Theoretical and Applied Information Technology*, 31(2): 100-108.

Lee, H.L. 2004. The triple-A supply chain. *Harvard Business Review*, 82(10): 102-112.

Lee, H. & Choi, B. 2003. "Knowledge management enablers, processes, and organisational performance: an integrative view and empirical examination". *Journal of Management Information Systems*, 20: 179-228.

Lee, I. & Lee, B. 2012. "Measuring the Value of RFID Investment: Focusing on RFID Budget Allocation". *IEEE Transactions on Engineering Management*, vol. 59:4551-559.

Leedy, P.D. & Ormrod, J.E. 2005. *Practical research, planning and design*, 8th ed. New Jersey: Pearson Education International.

Leedy, P.D. & Ormrod, J.E. 2010. *Practical research: planning and design*. Upper Saddle River, NJ: Pearson.

Li, S. & Visich, J.K. 2006. "Radio frequency identification supply chain impact and implementation challenges", *International Journal of Integrated Supply Management*, 2(4): 407-23.

Li, Z. and Zhu, T. 2009. Empirical study on the influence of social capital to knowledge transfer among individuals. *Journal of Software*, 4(4): 291-8.

Lim, C.P., Jain, L.C., Nishihara, Y., Kimura, A. & Ohsawa, Y. 2012. "Extracting users' interest from book-browsing behaviours recorded with RFID". *International Journal of Knowledge Based Intelligent Engineering Systems*, 16(1): 17-23.

Luen, T.W., & Al-Hawamdeh, S. 2001. Knowledge management in the public sector: principles and practices in police work. *Journal of Information Science*, 27(5): 311-318.

Lwoga, E.T., Ngulube, P. & Stilwell, C. 2010. "Understanding indigenous knowledge: bridging the knowledge gap through a knowledge creation model for agricultural development". *South African Journal of Information Management*, 12(1): 436-438.

<https://doi.org/10.4102/sajim.v12i1.436>

- Malhotra, Y. 2010. From information management to knowledge management: beyond the Hi-Tech Hidebound System. In Srikantaiah, K. & Koenig, M.E.D (eds.), *Knowledge management for the information professional*. Medford, New Jersey: Information Today, 37-61.
- Mastura, J., Ramayah, T., Abdul-Rashid, A., Basri, S. 2007. Technology readiness among managers of Malaysian construction firms. *Engineering, Construction and Architectural Management*, 14(2): 180-191.
- Matthews, B. & Ross, L. 2010. Research methods: a practical guide for the social sciences. Harlow: Longman.
- Mavodza, J. & Ngulube, P. 2011. Exploring the use of knowledge management practices in an academic library in a changing information environment. *South African Journal of Libraries and Information Science*, 77(1):15-25.
- Mentzer, J.T. and Firman, J. 1994. "Logistics control systems in the 21st century", *Journal of Business Logistics*, 15(1): 215-227.
- Mentzer, J.T. 2001. Supply chain management. Thousand Oaks: Sage Publications.
- Michell, R. & Boyle, B. 2010. "Knowledge creation measurement methods". *Journal of Knowledge Management*, 14(1): 67-82.
- Monahan, K. 2008. "New genes for inherited multiple polyps and cancer of the large bowel". PhD Thesis. United Kingdom: London Research Institute.
- Morgan, J., 2015. *The five types of organizational structures*. Available at: <http://www.forbes.com/sites/jacobmorgan/2015/07/06/the-5-types-of-organizational-structures-part-1-the-hierarchy/#684d6d23853f> (Accessed 19 October 2016).
- Mostert, J.C. & Snyman, M.M.M. 2007. "Knowledge management framework for the development of an effective knowledge management strategy". *South African Journal of Information Management*, 9(2):35-94.
- Mouton, J. 2005. *How to succeed in your master's and doctoral studies*. Sixth and Seventh Impressions. Pretoria: Van Schaik.
- Mouton, J. 2011. *How to succeed in your Masters & Doctoral Studies: a South African guide and resource book*. Pretoria: Van Schaik.

- Myers, M.D. 1997. "Qualitative research in information systems". *Management Information System Quarterly*, 21(2): 241-242.
- Nahavandi, A., Denhardt, R. B., Denhardt, J. V. & Aristigueta, M. P., 2015. *Organizational behavior*. 1st ed. Los Angeles: SAGE Publishers Ltd
- Neuman, W.L. 2006. *Social research methods: quantitative and qualitative approaches*, 6th Edition. Toronto: Dorling Kindersley.
- Ngai, E.W.T., Poon, J.K.L., Suk, F.F.C. & Ng, C.C. 2009. Design of an RFID-based Health care Management System using an Information System Design Theory. *Information Systems Front*, 11: 405-417.
- Ngulube, P. 2005. "Research procedures used by Master of Information Studies students at the University of Natal in the period 1982-2002 with special reference to their sampling techniques and survey response rates: a methodological discourse". *The International Information and Library Review*, 37(2): 127-143.
- Ngulube, P. 2009. *Research methods in information science*. Pretoria: University of South Africa.
- Ngulube, P. 2010. "Mapping mixed methods research in library and information science journals in sub-Saharan Africa 2004-2008". *The International Information and Library Review*, 42:252-261. Also available: <http://www.elsevier.com/locate/iilr> (Accessed 10 August 2016).
- Ngulube, P. & Lwoga, E. 2007. "Knowledge management models and their utility to the effective management and integration of indigenous knowledge with other knowledge systems". *Indilinga - African Journal of Indigenous Knowledge Systems*, 6(2): 117-131.
- Ngulube, P., Mathipa, E.R. & Gumbo, M.T. 2014. Theoretical and conceptual frameworks in social research. In Mathipa, E.R. and Gumbo, M.T. (Eds). *Addressing research challenges: making headway for developing researchers* (in press).
- Nguyen, Q.T.N., Neck, P.A. & Nguyen, T.H. 2009. "The critical role of knowledge management in achieving and sustaining organisational competitive advantage". *Journal of International Business Research*, 2(3): 3-16.
- Nguyen, T., Smyth, R. & Gable, G., 2004. Knowledge management issues and practices: a case study of a professional services firm, Fifteenth Australian Conference on Information Systems, Hobart, Tasmania.

- Nonaka, I. 1991. "The knowledge creating company". *Harvard Business Review*, 69:6.
- Nonaka, I. 1994. "A dynamic theory of organizational knowledge creation". *Journal of Organization Science*, 5 (1): 14-37.
- Nonaka, I. & Konno, N. 1998. "The concept of "Ba" building a foundation for knowledge creation. *California Management Review*, 4(3): 40-54.
- Nonaka, I. & Takeuchi, H. 1995. *Knowledge management cycle*. Available at: <http://www.hubpages.com/hub/htm/Nonaka-and-Takeuchi-knowledge-management-cycle>. (Accessed 10 August 2016).
- Nonaka, I. & Takeuchi, H. 1995. *The knowledge creating company: how Japanese companies create the dynamics of innovation*. New York: Oxford Press.
- Nonaka, I., Von Krogh, G. & Voelpel, S. 2009. "Organizational knowledge creation theory: revolutionary paths and future advances". *Organization Studies*, 27(8): 1178-1208.
- Nonaka, I. 2005. "Managing organizational knowledge", in Smith, K.G. and Hitt, M.A. (eds.), *Great Minds in Management: The Process of Theory Development*, Oxford University Press, Oxford.
- Olayinka, A. I. & Oriaku, R. 2006. *Methodology of Basic and Applied Research*. Ibadan: Postgraduate School.
- Onwuegbuzie, A.J. & Leech, N.L. 2006. "Linking research questions to mixed methods data analysis procedures". *The Qualitative Report*, 11(3): 474-498. Available: <http://www.nova.edu/htm/ssss/QR/QR11-3/onwuegbuzie.pdf/htm> (Accessed 11 September 2016).
- Onwuegbuzie, A.J. & Collins, K.M.T. 2007. "A typology of mixed sampling designs in social science research". *The Qualitative Report*, 12(2): 281-316. Available at: <http://www.nova.edu/ssss/QR/QR12-2/onwuegbuzie2.pdf>. (Accessed 19 July 2017).
- Onwuegbuzie, A.J. & Teddlie, C. 2002. A framework for analysing data in mixed methods research. In Tashakkori, A. and Teddlie, C. (eds). *Handbook for mixed methods in social and behavioural research*. London: Sage, 351-384.
- O'Sullivan, E., Rassel, G.R. & Berner, M. 2008. *Research methods for public administrators*. New York: Pearson.

- Owen, H. 1997. *Open Space Technology: A User's Guide*. 2nd ed. San Francisco (CA): Berrett-Koehler Publishers.
- Pellissier, R. 2008. *Number crunching*. Cape Town. Juta.
- Piramuthu, S. 2008. "Protocols for RFID tag/reader authentication". *Decision Support Systems*, 43: 897-914.
- Polanyi, M., 1962. *Personal knowledge: towards a post-critical philosophy*. Chicago: University of Chicago Press.
- Polniak, S., 2007. The RFID case study book: RFID application stories around the globe, *In: Abhisam Software*, 02.03.2011, Available: http://www.bin95.com/case_studies/RFID_Technology_Applications.htm (Accessed 29 October 2017).
- Powell, R.R. 1997. *Basic research for librarians*, 3rd ed. London: Ablex Publishing Corporation.
- Powell, R.R. & Connaway, L.S. 2014. *Basic research methods for librarians*. London: Libraries Unlimited.
- Raju, J. 2014. Knowledge and skills for the digital era academic library. **Journal of Academic Librarianship**, 40(2): 163-170.
- Ratcliffe-Martin, V., Coakes, E. & Sugden, G., 2000. Knowledge management issues in universities. *Vine*, 30(4):14-18. Available at: <https://doi.org/10.1108/eb040770> (Accessed 17 January 2018).
- Reyes, P.M. & Jaska, P. 2006. "A research agenda for RFID integrated supply chain management studies". *International Journal of Global Logistics and Supply chain Management*, 1(2): 98-103.
- Reyes, P. M., Worthington, W.J. & Collins, J.D. 2013. "Knowledge management enterprise and RFID systems: adoption to supply chain performance". *Management Research Review*, 38(1): 44-66.
- Romm, N. and Ngulube, P. 2014. Mixed methods research. In Mathipa, E.R. and Gumbo, M.T. (eds). *Addressing research challenges: making headway for emerging* (in press).
- Routhier Perry, S. (2014). Digitization and digital preservation: A review of the literature. **SLIS Student Research Journal**, 4(1). Retrieved from <http://scholarworks.sjsu.edu/slissrj/vol4/iss1/4> (Accessed

- Rowley, J. 2001. "Knowledge management in pursuit of learning: the learning with knowledge cycle". *Journal of Information Science*, 27(4): 227-237.
- Rowley, J. 2002. "Using case studies in research". *Management Research News*, 25 (1): 160-27.
- Rowley, J. 2003. "Knowledge management: the new librarianship? From custodians of history to gatekeepers to the future". *Journal of Library Management*, 24(8): 433-440.
- Saunders, M., Lewis, P. & Thornhill, A. 2012. Research methods for business students, 8th ed. England: Pearson Education Ltd.
- Schneider, C.W., Tautz, J., Grünewald, B. & Fuchs, S. 2012, "RFID Tracking of Sublethal Effects of Two Neonicotinoid Insecticides on the Foraging Behavior of *Apis mellifera*". *PLoS ONE*, vol. 7(1): 1-9.
- Sevinç, Y. & Kaya, A. 2012. "Reconfigurable antenna structure for RFID system applications using varactor-loading technique", *Turkish Journal of Electrical Engineering & Computer Sciences*, 20(4): 453-462.
- Sharma, R. & Chowdhury, N. 2007. "On the use of a diagnostic tool for knowledge audits". *Journal of Knowledge Management Practice*, 8(4). Available at: <https://ssrn.com/abstract=1270410>. (Accessed 14 March 2015).
- Sheng, Q. Z., Li, X., & Zeadally, S. 2008. "Enabling Next-Generation RFID Applications: Solutions and Challenges", *IEEE Computer*, 41(9): 21-28.
- Sikander, J., 2004. Microsoft RFID technology overview. Microsoft Cooperation.
- Singh, N.K. & Mahajan, P. 2014. "RFID and its use in libraries: A literature review". *International Journal of Information Dissemination and Technology*, 4 (2): 117-123.
- Slack, N., Chambers, S. & Johnston, R. 2004. *Operations Management* 4th ed. Upper Saddle River, NJ: Prentice Hall.
- Soo, C.W., Devinney, T.M. & Midgley, D.F. 1999. *The process of knowledge creation in organizations*. Centre for Corporate Change; Australian Graduate School of Management. The University of New South Wales, Australia.
- Stangor, C. 2011. *Research Methods for the Behavioural Sciences* 4th ed. Belmont: Wadsworth, Cengage Learning.

Taghaboni-Dutta, F. and Velthouse, B. 2006. "RFID Technology is Revolutionary: Who Should Be Involved in This Game of Tag?" *Academy of Management Perspectives*, 20(4): 65-78.

Takeuchi, H. & Nonaka, I. 2004. *Hitotsubashi on knowledge management*. Singapore: John Wiley and Sons, Asia.

Tashakkori, A. & Teddlie, C. 2003a. *SAGE handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage

Tashakkori, A. & Teddlie, C. 2009. *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*. Thousand Oaks, CA: Sage.

Teresko, J., 2003. Winning the wireless. Industry Week, June 1. Available at: www.indsutryweek.com/Archive.aspx. (Accessed 14 November 17).

Teresko, J. 2004. P&G's secret: Innovating innovation. Industry Week 253(12): 26.

Tikhomirova, N., Gritsenko, A. & Pechenkin, A., 2008. University approach to knowledge management. *Vine*, 38(1):16-21. Available at: <https://doi.org/10.1108/03055720810870851/> (Accessed 26 August 2017).

Tiwana, A. 2008. *The knowledge management toolkit: orchestrating IT, strategy and knowledge platforms*, 2nd ed. New Jersey: Prentice Hall.

Uniform Code Council, 2006. *International Code Council Online Library*. United States of America.

University of South Africa. 2007. *Policy on research ethics*. Pretoria: UNISA. Available: http://www.unisa.ac.za/contents/research/docs/ResearchEthicsPolicy_apprvCounc_21Sept2007.pdf (Accessed 15 November 2016).

Vacca, J.R., 2009. Computer and information security handbook. In: *Morgan Kaufmann Publishers*, Available from: <http://books.google.co.ma/books?id> (Accessed 24 July 2016).

Van Wyk, M.M. 2012. "Measuring student's attitudes to economics education: a factorial analysis approach". *Journal Social Science*, 31 (1):1-42.

Veiseh, A. & Monfared, J.H. 2015. RFID as an enabler of maintenance management, University College of Takestan, Pakistan.

- Vijayaraman, B.S., Osyk, B.A., and Chavada, D. (2008). An exploratory study of RFID adoption in the paperboard packaging industry. *Journal of Technology Management & Innovation*, 3(4), 95-110.
- Von Krogh, G., Nonaka, I. & Aben, M. 2001. "Making most of your company's knowledge: a strategic framework". *Long Range Planning*, 34: 421-439.
- Wai, L.W. & Jayasingam, S. 2012. "Factors driving knowledge creation among private sector organisations: empirical evidence from Malaysia" *Journal of Organisational Knowledge Management*, 2012:1-12.
- Wamundila, S. & Ngulube, P. 2011. "Enhancing knowledge retention in higher education: a case of the University of Zambia". *South African Journal of Information Management*, 13(1): 439-448.
- Wang, K., Hjelmervik, O. & Bremdal, B., 2001. *Introduction to Knowledge Management: principles and practice*. Trondheim: Tapir Academic Press.
- Wang, L. 2008. Enhancing construction quality in management using RFID technology. *Automation in Construction*, 17(4), 467-479.
- Wang, L., Lin, Y., Pao, H. 2007. Dynamic mobile RFID- based supply chain control and management system in construction. *Advanced Engineering Informatics*, 21(4): 377-390.
- Wang, Y-M., Wang, Y-S. and Yang, Y-F. 2010. 'Understanding the determinants of RFID adoption in the manufacturing industry', *Technological Forecasting and Social Change*, 77(5): 803–815.
- Want, R. 2004. "Enabling ubiquitous sensing with RFID," *Computer*, 37(4): 84-86.
- Want, R. 2004. "RFID-a key to automating everything. *Scientific American*, 290(1):56-65.
- Want, R. 2004. The magic of RFID. *ACM Queue*, 2(7):41-48.
- Wickramasinghe, N., Geisler, E. & Schaffer, J. 2005. "Realizing the value proposition for healthcare by incorporating KM strategies and data mining techniques with the use of information communication technologies". *International Journal of Healthcare Technology and Management*, 7(3/4): 303–318.

- Wiig, K.M. 1999. Knowledge management: an emerging discipline rooted in a long history. New York: Butterworth-Heinemann.
- Wiig, K.M. 2004. People-focused knowledge management. New York: Butterworth-Heinemann.
- Wilkinson, P. 2005. Construction collaboration technologies: the extranet revolution. London: Taylor & Francis.
- Wing, R. 2006. RFID applications in construction and facilities management. *Electronic Journal of Information Technology in Construction*, 11: 711-721. (Accessed 20 March 2017)
- Woetzel, J., Garemo, N., Mischke, J. and Palter, R. 2016. Bridging Global Infrastructure Gaps, McKinsey Global Institute. <http://www.mckinsey.com/industries/capital-projects-andinfrastructure/our-insights/bridging-global-infrastructure-gaps> (Accessed 14 July 2016).
- Yahia, Z.M. 2010. Coupling RFID with supply chain to enhance productivity. *Business Strategy Series*, 11(2): 107-123.
- Yin, R.K. 2003. Case study research: design and methods. Thousand Oaks, California: Sage.
- Yin, R.K. 2009. Case study research: design and methods. Thousand Oaks, California: Sage.
- Yu, S.C., 2007, "RFID Implementation and benefits in Libraries", *The electronic Library*, 25(1): 54-64.

A

APPENDIX A: DEMOGRAPHIC INFORMATION

1. Name and surname (provide details): (Optional) _____

2. Gender (select one):

Male	Female
------	--------

3. Age (in years):

≤19	20-29	30-39	40-49	50-59	≥60
-----	-------	-------	-------	-------	-----

4. Employee designation type (select one):

Non Professional librarian	Professional librarian	Other
----------------------------------	---------------------------	-------

5. Designation/job title (provide details): _____

6. Highest level of educational qualification? (select applicable):

Qualification	Select
1. PhD or equivalent degree	
2. Master's degree	
3. Honours degree	
4. Bachelor's degree	
5. Diploma	
6. Certificate	
7. Other (please specify) _____	

7. Employee directorate and section (select one):

Directorate		Sections/Units	Select One
Client Services	1	Research and Subject libraries	
		Branch librarians (Muckleneuk)	
		Archive Services	
		Client Training	
Information Resources Content Management	2	IR Collection development	
		Cataloguing	
		IR quality reporting	

Information Resources Distribution	3	Request and Information Search Services	
		Request and Delivery Services	
		IR Housing Services	
Library Corporate Services	4	Library Admin and Support	
		Library Technology Services	
		Library Procurement Services	
		Library Financial Services	
		Planning, Quality and Research	

SECTION A: KNOWLEDGE MANAGEMENT and UNISA ACADEMIC LIBRARY

8. Are you familiar with concept of knowledge management? (select one):

Yes	No
-----	----

9. If you answered **Yes** to questions 8, please provide your definition for the following:

Knowledge:

Explicit Knowledge:

Tacit Knowledge:

Knowledge management:

Knowledge generation:

Knowledge acquisition:

Knowledge sharing:

Knowledge transfer:

Knowledge retention:

10. Are you involved in any knowledge management activities/ practices /programmes? (select applicable):

Yes	No
-----	----

11. If you answered Yes to question 10 above, please provide details of the activities/ practices / programmes:

APPENDIX B: RFID AND KNOWLEDGE MANAGEMENT

12. How frequently do you utilise the various RFID equipment or features when conducting your daily operations? (Please select one of the usage frequencies below). Also, include any additional RFID equipment or features not included in the table.

RFID Equipment type	Not at all	Daily	Weekly	Monthly	Ad hoc
1. Book Return (Clients)					
2. Book Sorter (library Staff)					
3. Self-checkout (clients)					
4. Staff workstation (library staff)					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13. Other (please specify)					

13. How many years of experience do you have in using library RFID technologies, including your current and previous experience? (select one):

<5	5-9	10-15	16-24	25-30	≥31
----	-----	-------	-------	-------	-----

14. Please indicate any interventions you have taken in order to enhance your skills of utilising the library RFID technologies? (select applicable):

Interventions	Select
1. Training courses	
2. Tutorials	
3. Guide/Manuals	
4. Other (please specify)	

15.

Do you regard RFID technologies to be an important component for knowledge management within the library. (select applicable)

Yes	No
-----	----